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BART IMPACT PROGRAM
IMPLICATIONS OF BART'S ENVIRONMENTAL IMPACTS
FOR THE
TRANSPORTATION DISADVANTAGED



January 1978
TECHNICAL MEMORANDUM

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Prepared for
U.S. DEPARTMENT OF TRANSPORTATION
and
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Washington, D.C.

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DOCUMENT NO. DOT-BIP-TM 34-10-78
PREPARED BY URBAN DYNAMICS ASSOCIATES
UNDER CONTRACT WITH THE METROPOLITAN TRANSPORTATION COMMISSION
FOR THE U.S. DEPARTMENT OF TRANSPORTATION
AND THE U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
UNDER CONTRACT NO. CA 09-0042, AMENDMENT 1.

1. Report No. DOT-BIP-TM 34-10-78	2. Government Accession No.	3. Report's Catalog No.
4. Title and Subtitle IMPLICATIONS OF BART'S ENVIRONMENTAL IMPACTS FOR THE TRANSPORTATION DISADVANTAGED	5. Report Date January, 1978	6. Performing Organization Code
7. Author(s) Robert M. Donnelly, Jesus S. Arguelles, J. Hinz del	8. Performing Organization Report No. DOT-BIP-TM 34-10-78	
9. Performing Organization Name and Address Urban Dynamics Associates 1045 Sansome Street, Suite 302 San Francisco, California 94111	10. Work Unit No. (TRIS) Task Order 10	11. Contract or Grant No. CA 09-0042
12. Sponsoring Agency Name and Address U. S. Department of Transportation and U. S. Department of Housing and Urban Development Washington, D. C.	13. Type of Report and Period Covered Technical Memorandum	14. Sponsoring Agency Code
15. Supplementary Notes The Metropolitan Transportation Commission is the prime contractor for the BART Impact Program. Urban Dynamics Associates is the subcontractor responsible for the Implications for the Transportation Disadvantaged Project.		
16. Abstract This is the first of four interim reports to be developed by the Implications for the Transportation Disadvantaged (ITD) Project of the BART Impact Program (BIP). This report focuses on the environmental impacts of BART's construction and operations on the transportation disadvantaged. Subsequent reports will analyze mobility, economic and land use impacts of BART as they affect special population groups. The special population groups included in the analyses in this report are ethnic minorities (Black, Spanish heritage, Asians and others), the elderly, and the handicapped. Six issues related to possible environmental impacts of the construction or operation of the BART system for the transportation disadvantaged are examined. Information developed in the major project areas of the BIP is applied in the investigation of each issue.		
17. Key Words Bay Area Rapid Transit, BART Impact Program, rapid rail transit, environment, transportation disadvantaged.	18. Distribution Statement Document is available to the public through National Technical Information Service, Springfield, Virginia 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 78
		22. Price



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BART: The Bay Area Rapid Transit System

Length: The 71-mile system includes 20 miles of subway, 24 miles on elevated structures and 27 miles at ground level. The subway sections are in San Francisco, Berkeley, downtown Oakland, the Berkeley Hills Tunnel and the Transbay Tube.

Stations: The 34 stations include 13 elevated, 14 subway and 7 at ground level. They are spaced at an average distance of 2.1 miles: stations in the downtowns are less than one-half mile apart while those in suburban areas are two to four miles apart. Parking lots at 23 stations have a total of 20,200 spaces. There is a fee (25 cents) at only one of the parking lots. BART and local agencies provide bus service to all stations.

Trains: Trains are from 3 to 10 cars long. Each car is 70 feet long and has 72 seats. Top speed in normal operations is 70 mph with an average speed of 36 mph including station stops. All trains stop at all stations on the route.

Automation: Trains are automatically controlled by the central computer at BART headquarters. A train operator on board each train can override automatic controls in an emergency.

Magnetically encoded tickets with values up to \$20 are issued by vending machines. Automated fare gates at each station compute the appropriate fare and deduct it from the ticket value. At least one agent is present at each station to assist patrons.

Fares: Fares range from 25 cents to \$1.45, depending upon trip length. Discount fares are available to the physically handicapped, children 12 and under, and persons 65 and over.

Service: BART serves the counties of Alameda, Contra Costa and San Francisco, which have a combined population of 2.4 million. The system was opened in five stages, from September, 1972, to September, 1974. The last section to open was the Transbay Tube linking Oakland and the East Bay with San Francisco and the West Bay.

Routes are identified by the terminal stations: Daly City in the West Bay, Richmond, Concord and Fremont in the East Bay. Trains operate from 6:00 a.m. to midnight on weekdays, every 12 minutes during the daytime on three routes: Concord-Daly City, Fremont-Daly City, Richmond-Fremont. This results in 6-minute train frequencies in San Francisco, downtown Oakland and the Fremont line where routes converge. In the evening, trains are dispatched every 20 minutes on only the Richmond-Fremont and Concord-Daly City routes. Service is provided on Saturdays from 9 a.m. to midnight at 15-minute intervals. Future service will include a Richmond-Daly City route and Sunday service. Trains will operate every six minutes on all routes during the peak periods of travel.

Patronage: Approximately 142,000 one-way trips are made each day. Approximately 200,000 daily one-way trips are anticipated under full service conditions.

Cost: BART construction and equipment cost \$1.6 billion, financed primarily from local funds: \$942 million from bonds being repaid by the property and sales taxes in three counties, \$176 million from toll revenues of transbay bridges, \$315 million from federal grants and \$186 million from interest earnings and other sources.

March 1978

SUMMARY

This is the first of four interim reports to be developed by the Implications for the Transportation Disadvantaged (ITD) Project prior to preparation of a Final Report in April, 1978. This report focuses on the environmental impacts of BART's construction and operations on the transportation disadvantaged. Subsequent reports will analyze mobility, economic, and land use impacts of BART as they affect special population groups.

Definition of Transportation Disadvantaged

The special population groups included in the analyses in this report are:

- ethnic minorities: Blacks, Spanish heritage, Asians and others;
- the elderly; and
- the handicapped.

Population Characteristics of the Transportation Disadvantaged

In the three counties in which BART operates (San Francisco, Alameda and Contra Costa), ethnic minority persons constitute nearly one-third of the total population; thirteen percent (13%) Black, thirteen percent (13%) Spanish surname, and six percent (6%) other. Within the immediate BART impact area (within one-quarter mile of lines and stations), ethnic minorities are found in greater concentrations; twenty percent (20%) Black and sixteen percent (16%) Spanish surname. Over fifty percent (50.7%) of the Black population in the three county area live in census tracts within one-quarter mile of BART, forty percent (39.6%) of the Spanish surname population and only twenty-seven (27.2%) of the non-Black, non-Spanish population.

Based on a classification criterion of more than forty percent (40%), eighteen (18) of the thirty-four (34) BART stations are located in areas (one-half mile radius) of high total ethnic minority concentration. Within the immediate station impact area (one-quarter mile) there are 41,293 persons living around stations located in non-downtown areas of high concentrations of ethnic minorities; 13,200 in non-downtown areas of low concentrations of ethnic minorities.

The elderly (65 years and older) constitute eight percent (8%) of the total population residing within the three county BART area and eleven percent (11%) in the BART impact corridor. As many as fifteen percent (15%) of the elderly suffer from some type of mobility impairing handicap.

Handicapped persons appear to be generally evenly distributed in the BART service areas, with no identifiable concentrations revealed by census tract data. The elderly are also fairly evenly distributed throughout the BART service area; however, the greatest concentrations of older persons are found around downtown stations. Four of the eight station areas with high concentrations of elderly (greater than 15%) are located in downtown areas.

Issue Investigations: Conclusions

Six issues relating to possible environmental impacts of the BART system on the transportation disadvantaged are examined in this report. Information developed in the various project areas of the BART Impact Program has been applied in the evaluation of each issue.

ISSUE NUMBER ONE: BART has significantly reduced the quality of life in ethnic minority residential neighborhoods around the station by:

- creating parking problems,
- increasing automobile congestion, and
- increasing traffic safety hazards.

Conclusion: The principal negative environmental impact caused by BART's operation is induced commuter auto traffic within station areas. The extent of traffic related problems is a function of both the level of auto use by BART riders to and from the station and the areas physical and social environment. Most BART provided parking facilities are located in suburban areas and urban residential areas with low to moderate concentrations of ethnic minorities. Most of the auto-related environmental impacts are occurring in these areas. Five of the seven station areas experiencing overflow from BART provided parking are located in majority areas. However, Daly City, a terminal station located in an urban residential area of relatively high ethnic minority population, is experiencing serious overflow parking impacts. The minority station areas of Glen Park and Balboa Park in San Francisco are also experiencing BART induced auto impacts, including on-street parking by BART users since there is no BART provided parking at those stations. Auto access impacts of BART can be expected to increase in the future with growing BART ridership, unless improved feeder bus service and/or changes in BART parking policy would reduce current levels of station auto access use. Also, community support for neighborhood permit parking programs may lead to preferential parking regulations which restrict BART related off-street parking in areas where overflow parking is a serious problem.

ISSUE NUMBER TWO: BART noise and environmental intrusion, e. g. vibration, and loss of privacy, are especially strong negative factors around line segments in ethnic minority areas.

Conclusion: From comparisons of noise levels throughout the length of the seventy-one (71) mile BART system and the effects on selected population groups, those areas which are populated by high concentrations of ethnic minorities experience less impact from noise, vibration and loss of privacy, than non-minority station areas and line segments. Factors responsible for this include: the use of subways in Oakland, San Francisco and Berkeley; the location of BART line segments adjacent to frequently used railroad lines; and the location of BART lines within or adjacent to freeways and major thoroughfares. Within the latter two locations, the ambient noise levels are higher than those generated by BART.

ISSUE NUMBER THREE: BART tracks are a barrier as they pass through ethnic minority communities.

Conclusion: BART tracks are not a barrier as they pass through ethnic minority communities. The placement of BART adjacent to major roadways, within arterial medians or underground, reduces or eliminates the potential barrier effect of line segments. Furthermore, BART divides differing and often incompatible rather than similar land uses. Where similar land uses are traversed, BART is located within a subway configuration, minimizing the long-term effect on users of the adjacent land uses. Where BART has been fenced, beneficial safety and security effects have resulted. Pedestrian traffic has been channeled over potentially dangerous railroad rights-of-way with pedestrian bridges.

BART overflow parking is generally perceived as a nuisance by a majority of residents in BART station areas where the problem exists. A substantial number of residents are found to also perceive overflow parking as a "barrier". This was found to be true in the Daly City station area, the only station area with high ethnic concentration. Since densities are greater in such areas with high concentrations of ethnic minorities, a larger population in these communities may be subject to parking impacts perceived as "barrier" effects.

ISSUE NUMBER FOUR: Personal security of BART users may be a problem, particularly during evening hours. There may be differences in the level of surveillance and protection in minority areas and differences in the way minorities, the elderly and the handicapped perceive personal security.

Conclusion: The overall impact of BART on crime and personal security is minimal in both areas of high and low concentrations of ethnic minorities. Initiation of evening service does not appear to have contributed to an increase in personal security problems within the BART system. There is no indication of differences in policy surveillance and protection between areas of low and high ethnic concentrations. Similarly, no evidence has been revealed which supports the hypothesis that there are differences in the way minorities, the elderly and the handicapped perceive personal safety.

ISSUE NUMBER FIVE: BART construction activities caused greater disruption in ethnic minority communities over a more prolonged time period than in non-minority communities. Upon completion of BART, adverse long-term environmental effects were less in minority than non-minority communities.

Conclusion: Residential areas with high concentrations of ethnic minorities were subject to longer periods of construction affecting more people in locales which were more sensitive to disruptive effects (e.g., within street sections or community commercial areas). Construction activity in downtown areas was even longer and more severe than in urban residential and suburban areas with high concentrations of ethnic minorities. In downtown San Francisco and Oakland, the elderly and ethnic minority residents were adversely effected by construction activities. The extensive use of subway sections and related downtown street improvement and beautification programs are the primary factors for extending construction activities in these areas. On the other hand, greater housing displacement was required in areas of low concentrations of ethnic minorities.

ISSUE NUMBER SIX: BART has improved the environmental quality of communities around stations because of related street improvement projects, beautification programs, parks and landscaping, including passive and active recreational facilities.

Conclusion: Bay Area residents have received considerable benefit from the street, landscaping and beautification projects coordinated with BART's construction. Pedestrian traffic in many BART station areas has been substantially enhanced. All population sectors in the Bay Area gained from these environment projects and programs. The elderly and the handicapped received circulation benefits from the pedestrian orientation (curb cuts, signing, street furniture, etc.) of many of the projects, e.g. Market Street improvement project. Improvements generally reflect the character of the surrounding area. Mission Street is the only project which is poorly maintained.

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I. INTRODUCTION

The United States Department of Transportation (DOT) and the Department of Housing and Urban Development (HUD) have sponsored and are funding a long-term, policy-oriented study and evaluation of the impact of the new 71-mile Bay Area Rapid Transit system (BART) in the San Francisco-Oakland metropolitan area. The program is being managed by the area's Metropolitan Transportation Commission (MTC). The program, initiated in 1972, is expected to be completed in 1978. Projects are being prepared by consulting firms, universities, research institutions, and public agencies working under contract with MTC and, in some cases, by MTC itself.

Built at a cost of \$1.6 billion, BART is a major element in the Bay Area program of transportation development. As the first regional rapid transit system to be built in this nation in more than 50 years, BART is of great interest to the Bay Area, other metropolitan areas across the country that are considering investments in improved transportation, and to the federal government which is providing financial aid for transportation improvements, urban development and environmental protection. Considering the magnitude of these concerns, there is a great need for accurate information on the impacts on the Bay Area resulting from the BART investment. Analyses and interpretations of BART impacts can be of vital assistance to those responsible for future decisions throughout the nation.

Purpose of the BART Impact Program

For approximately the first two years of the BART Impact Program, the specific objectives of the impact assessment program were formulated in terms of three kinds of questions, to which answers were sought.

1. What are the impacts of BART on the various aspects of metropolitan life?
2. Why do these impacts occur or occur in ways other than expected?
3. How can best advantage be made from the BART investment and how can the Bay Area and other metropolitan areas improve their transportation systems based on BART's experience?

The BART Impact Program defined six major impact studies. These are listed below.

1. Transportation System and Travel Behavior.
2. Land Use and Urban Development.
3. Economics and Finance.
4. Environment.
5. Public Policy.
6. Institutions and Lifestyles.

Purpose of the Implications for the Transportation Disadvantaged Project (ITD)

In addition to exploration of the what, why and how questions, the Metropolitan Transportation Commission now requires each of these studies to explicitly consider specific population groups who are affected by BART impacts, in particular, the transportation disadvantaged.

The Implications for the Transportation Disadvantaged (ITD) Project will examine results of the major impact assessment projects in relation to:

- What impacts have occurred? (beneficial and adverse)
- Where are they occurring?
- Who is affected?
- Are the disadvantaged disproportionately affected?
- Are the disadvantaged more severely affected?

The overall objectives of the ITD Project are to:

1. Interpret the impacts identified in all other program activities in a unified way, integrating results from other work areas of limited scope into broad conclusions about BART impacts on the special population groups. This technical integration function will guard against overlooking impacts which may seem to fall on the disciplinary border between the six impact assess-

ment projects. It will also present the opportunity for synthesis of additional results which are more apparent from the broad overview perspective. The Study Design will serve as a guide for this work.

2. Assure that appropriate consideration is given to the identified issues and special population groups in each of the impact assessment projects and that data for such assessments are collected in the impact projects in a way which permits this consideration. This will require reviewing survey and analysis plans of other projects and developing procedures for information exchange among contractors and MTC.
3. Identify areas of impact on disadvantaged population groups which are outside the reasonable purview of other BART Impact Program activities and designate appropriate ways in which such assessments could be conducted beyond the scope of the ITD Project.

Four areas of potential BART impact are to be examined in the ITD study — environmental issues; mobility issues; economic, employment and financial issues; and land use and urban development issues. For each of these impact areas, an interim report evaluating the impacts of BART on the special population groups included in the transportation disadvantaged, will be prepared as part of the ITD study. The Final Report of the ITD Project will integrate these findings and summarize the implications of BART for the transportation disadvantaged. A general evaluation will be given in the Final Report providing a comparison of the benefits and costs of BART for the special population groups.

Definition of the Transportation Disadvantaged

The topic of "who are the transportation disadvantaged?" was examined in Phase I of the ITD Project. The examination considered those who are transportation disadvantaged and those who are generally socially disadvantaged. The study concluded that only a tenuous case, at best, can be made that the poor, minorities, handicapped, elderly, women and youth are really "transportation disadvantaged", but that these groups have certain general disadvantages vis a vis society which make them a special concern, in an equity sense, in planning a transportation system.

The special population groups of interest to this project include those minority segments of the Bay Area population generally considered to be disadvantaged for one reason or another.

The focus of the ITD Project is restricted to ethnic minorities, the elderly and those disabled people with physical handicaps which impair their mobility.¹ These groups are "transportation disadvantaged" by a specific mobility impairment (as the handicapped and the elderly) or by low income and discrimination

¹ McGuire, Chester: Who Are the Transportation Disadvantaged? (WP), April, 1976. (A complete citation for each source footnoted in this report is given in the reference section.)

which may affect both their transportation needs and the accessibility of transportation opportunities. Ethnic minorities are of interest because differences in culture, lifestyles, and economic status may influence the ways in which they are affected by impacts, perceive or respond to BART's facilities, operation, policies, financing and other effects.

Additionally, since BART was primarily designed to serve long distance travel from outlying sections of the Bay Area, an overall concern is the extent to which it serves the special transportation needs of the disadvantaged population.

Ethnic Minorities

For the purpose of the ITD Project, the ethnic groups studied are those which make up the three major minority populations of the San Francisco Bay Area:

- Blacks,
- Spanish Heritage, and
- Asians.

These ethnic groups constitute approximately one-third the total population of the three county BART Service Area. "Blacks" include all persons reported in the U.S. Census of Population and Housing as Negroes. "Spanish Heritage" includes all individuals reported in the census under the following categories: persons of Spanish language, other persons of Spanish surname, persons of Puerto Rican birth or parentage. In some cases where data are unavailable, Spanish is restricted to Spanish surname. Generally, in the ITD study, "Asians" refer to the three principal subgroups of Chinese, Japanese and Filipinos. Other minority groups represented to a significantly lesser extent in the Bay Area population, include other orientals (e.g. Korean, Vietnamese) and Native Americans. Where data are available, persons in these groups are included in the analysis of BART impacts on the total minority population of the Bay Area.

Elderly

The elderly population is defined to be those persons 65 years of age or older. This transportation disadvantaged group is of particular interest due to generally low-fixed annual incomes and high incidence of mobility impairing disabilities. It is estimated that over sixty percent of the handicapped population in the United States are 65 years of

age or older.²

Handicapped

The ITD study's focus on the handicapped population is for those individuals with physical, mental or emotional disabilities which restrict or preclude use of conventional private or public transportation facilities. These include:

- Non-ambulatory disabilities,
- Semi-ambulatory disabilities,
- Functional disabilities,
- Sight and Hearing disabilities, and
- Developmental disabilities.

For the severely handicapped individual, there are often numerous problems in addition to the specific handicap itself: advanced age, low income, and lack of specific work skills or education.

Purpose of the Environmental Issues Report

As discussed above, this is the first of four interim ITD reports examining BART's impacts on the transportation disadvantaged. This report investigates the level of both positive and negative environmental impacts of BART on these special population groups, and the extent to which these environmental impacts are more or less severe than, or are perceived differently than, impacts on the general population.

Environmental Impacts of interest to the ITD study are those impacts on the special population groups, which have occurred as the result of construction of BART, and those impacts which are occurring as the result of BART's operational characteristics. In general, direct environmental impacts may be categorized as follows:³

- Acoustic: Sound and Vibration;
- Atmospheric: Regional and Local Air Quality, Microclimate;
- Natural: Biota, Soils and Geology, Drainage and Water;

² McGuire, Chester: Who Are the Transportation Disadvantaged? (WP), April, 1976.

³ Gruen Associates, Inc. and DeLeuw, Cather & Co.: Environmental Impact of BART, Final Report, July, 1977.

- Social: Household and Business Displacement, Barriers, Safety, Security, Privacy; and
- Visual: Visual Quality, Illuminations, Shadows.

It is the purpose of the ITD study to identify the implications of these environmental impacts of BART's construction and operations on the transportation disadvantaged. In order to draw these implications, a set of specific issue statements is examined using the best information available from the BART Impact Program (BIP). During Phase I of the ITD study, a number of environmental issues were considered for inclusion within this report. After considerable review of completed and soon to be completed tasks within the six BIP project areas, a list of key environmental issues were developed and are employed in this report as the focus of analysis. These six issues are listed in Chapter III: "Environmental Issues Investigation".

II. POPULATION CHARACTERISTICS OF THE TRANSPORTATION DISADVANTAGED

In order to evaluate the extent of BART related impacts vis a vis ethnic minorities, the elderly and the handicapped, it is necessary to identify certain key population related impact determinants for these groups. The most important of these are:

- Population Size,
- Locational Distribution, and
- Degree of Geographic Concentration.

These population characteristics are directly related to BART service area, line segment, and station area impact, incidence and severity.

Sources of Information

The only extensive source of data which permits identification of the geographic population characteristics of the disadvantaged is the 1970 U. S. Census of Population and Housing. The fact that this primary source of population data was enumerated seven years ago in the pre-BART period, gives reason for some concern in the estimation of specific BART population related impacts. Checks of the accuracy and currency of the census data were conducted within the Environment Project. It is the conclusion of this work that the 1970 U. S. Census provides a useful data base for BART impact evaluation and that there appear to have been no gross changes in residential population characteristics which invalidate the 1970 data in representing present day conditions.⁴

Census data are available at the county and census tract level for most population characteristics. More limited data can be drawn from block statistics. In general, the most extensive information is available for race and age at the census tract level.

Secondary sources of population data which have provided the analysis of 1970 census data used in this report are:

- Environment Project (BIP),
- Phase I: ITD Project (BIP),
- The Minority Transportation Needs Assessment Project (MTNAP), and
- Environmental Impact Appraisal Process (MTC).

⁴ DeLeuw, Cather & Co.: BART and Its Environment: Descriptive Data (WN), March, 1976.

The Environment Project identified locations of Blacks, Spanish heritage and the elderly within one-quarter mile of line segments and stations. Phase I: Implications for the Transportation Disadvantaged Project, identified locations of Blacks, Spanish heritage and Asians around one-half mile radii of BART's stations and included income information. Currently, the Minority Needs Transportation Assessment (MTNAP) project is mapping ethnic minorities by specific subcategories throughout the nine county Bay Area. MTNAP uses dot maps (each dot is equal to fifty residents within each ethnic subcategory) represented on a series of map overlays. This study should be completed later this year.

This technical memorandum uses identification of the locations of disadvantaged from both the Environment Project and the Phase I ITD Study. The Environment Project is specifically useful because it includes the elderly population over 65 years, line segments and station area data. The Phase I ITD Study is useful because it provides income information and identifies the location of Asians around station areas.⁵

Ethnic Minorities

Three County BART Area

According to the 1970 Census, ethnic minorities constituted almost one-third (32%) of the population of the three Bay Area counties in which BART operates; Alameda, Contra Costa and San Francisco. Blacks and Spanish surname persons were represented in approximately equal numbers (13% each of total population) and Asians constituted a significant subgroup (6%). As shown in Table II - 1, the highest county concentration of Blacks was in Alameda, and the highest concentrations of Spanish surname and Asians were in San Francisco.

BART Impact Corridor

Table II - 2 shows the estimated numbers of Blacks and Spanish surname persons residing in the near vicinity of BART lines. Over fifty percent (50.7%) of the Black population in the three county area are shown to live in census tracts within one-quarter mile of BART lines and stations. Approximately forty percent (39.6%) of the Spanish surname population live in this same BART impact area. No data are available for the number of Asians residing within one-quarter mile area of the BART system. Of the 774,914 persons living within one-quarter mile of BART, 475,394

⁵ Locational population data for Asians were not tabulated as part of the Environment Project.

Table II - 1
BAY AREA ETHNIC MINORITIES
SUMMARY POPULATION STATISTICS
(1970 U. S. Census)

Area	Blacks ^a		Spanish Surname ^a		Asians ^b		Total Minority	
	#	%	#	%	#	%	#	%
SMSA (5 counties)	330, 107	11	373, 979	12	164, 828	5	868, 914	28
Three County BART Area	298, 980	13	297, 378	13	145, 553	6	741, 911	32
Alameda County	161, 282	15	139, 093	13	39, 616	4	339, 991	31
Contra Costa County	41, 620	8	52, 717	9	9, 756	2	104, 093	19
San Francisco	96, 078	13	105, 568	15	96, 181	14	297, 827	42

^a Source: DeLeuw, Cather & Company: BART and Its Environment: Descriptive Data, (WN), March, 1976.

^b Asians: Chinese, Japanese and Filipinos.
Source: Jefferson Associates: Phase I Final Report: MTNAP, June 30, 1977.

Table II - 2
ETHNIC MINORITIES SUMMARY
POPULATION STATISTICS
BART IMPACT AREA^a
(1970 U. S. Census)

BART Lines	Blacks		Spanish Surname		Total Population
	#	%	#	%	
Freemont Corridor	59,648	22	48,906	18	274,014
Concord Corridor	14,886	11	6,712	5	140,750
Richmond Corridor	43,831	32	10,766	8	138,928
Daly City Corridor	33,279	18	51,492	27	190,502
TOTAL BART SYSTEM	151,644	20	117,876	16	744,914

^a Includes census tract within one-quarter mile of BART.

Source: DeLeuw, Cather & Company: BART and Its Environment: Descriptive Data, (WN), March, 1976.

persons represent a non-Black, non-Spanish surname majority group, including an indeterminate number of Asians. Approximately one-quarter (27.2%) of this population group lives within the immediate BART impact area.

These aggregate statistics indicate that due to the corridor location of the BART system and the geographical distribution of Blacks and Spanish surname persons in the Bay Area, these ethnic minority groups may be expected to be substantially more affected by BART related environmental impacts where they occur within the immediate vicinity of the system. However, the type and degree of BART impacts vary considerably by type of BART configuration for individual line segments and stations. Therefore, a series of site specific analyses is necessary to draw any overall conclusion regarding disproportionate environmental impact incidence vis a vis specific population groups.

BART Station Areas

Since it has been determined in the Environment Project that most BART related environmental impacts do not extend beyond four city blocks, the most relevant aerial unit of analysis is the area within one-quarter mile of a station. However, the most complete data source for station area population characteristics is tabulated for the area within one-half mile of each station.⁶ These data provide a useful population profile of the BART station areas for each major ethnic group and household income characteristics. Where data are available on the finer scale (one-quarter mile radius), they have been utilized to supplement the analysis.

Table II - 3 lists each of the thirty-four BART stations and shows the size of the total population within one-half mile of each BART station, percentage of each major minority group, and estimated median income. These figures provide the best indicator available of the detailed population characteristics of the smaller area around BART stations (four block radius) in which most BART environmental impacts occur. The total population residing within one-quarter mile of each station is also shown in order to better determine the absolute number of persons expected to be affected by BART's environmental impacts.

The table clearly indicates that San Francisco and Berkeley have the highest densities of population located within one-half mile of BART stations. San Francisco has by far the greatest density of population within one-quarter mile radius of BART stations, e. g. the two Mission District and the

⁶ McGuire, Chester: Who Are the Transportation Disadvantaged? (WP), April, 1976.

Table II - 3

SELECTED CHARACTERISTICS OF THE POPULATION
1970 CENSUS DATA FOR BART STATIONS

Station	Total Pop- ulation within One- Quarter Mile ^a	Population Within One-Half Mile Radius ^b					Income
		Total Population	Per- cent Black	Percent Spanish Heritage	Per- cent Other	Percent of Total Minority	
1. Concord	997	5,650	0.0	7.0	2.2	9.2	\$11,215
2. Pleasant Hill	785	3,166	0.2	7.0	2.6	9.8	13,346
3. Walnut Creek	763	3,600	0.3	6.4	1.8	8.5	10,744
4. Lafayette	727	--	0.3	3.5	1.2	5.0	16,400
5. Orinda	298	--	0.0	3.2	0.5	3.7	21,474
6. Rockridge	2,381	9,237	16.0	4.2	3.2	23.4	8,023
7. Richmond	1,756	8,914	27.6	16.4	1.6	45.6	8,041
8. Del Norte	936	5,585	15.8	7.2	8.6	31.6	13,272
9. El Cerrito Plaza	1,607	9,250	2.4	7.8	5.3	15.5	15,176
10. North Berkeley	2,533	11,553	25.7	8.2	14.3	48.2	9,398
11. Berkeley	3,795	20,813	7.0	4.8	10.0	21.8	7,187
12. Ashby	3,116	20,215	59.1	4.2	3.4	66.7	7,756
13. Fremont	0	2,039	0.0	15.0	2.0	17.0	11,167
14. Union City	0	--	0.0	86.0	2.0	88.0	8,400
15. South Hayward	1,763	1,519	0.2	21.7	2.7	24.6	9,562
16. Hayward	756	4,565	0.2	36.3	2.7	39.2	9,175
17. Bayfair	1,283	7,883	0.1	18.5	2.8	21.4	10,710
18. San Leandro	903	5,976	0.0	23.3	2.2	25.5	10,320
19. Coliseum	675	6,548	82.7	9.5	3.2	95.4	5,707
20. Fruitvale	1,856	6,624	18.9	37.2	6.8	62.9	7,108
21. Lake Merritt	2,042	5,158	10.5	4.9	33.7	49.1	7,965
22. MacArthur	2,361	11,027	63.7	8.9	4.7	77.3	9,265
23. 19th Street	1,795	9,441	22.4	7.0	5.6	35.0	7,626
24. 12th Street	1,115	7,921	25.2	9.7	16.8	51.7	7,334
25. W. Oakland	2,240	6,295	89.4	5.0	1.6	96.0	4,711
26. Daly City	2,219	10,417	25.5	19.0	8.7	53.2	10,373
27. Balboa Park	1,898	14,686	11.8	20.5	8.8	41.1	10,952
28. Glen Park	3,574	13,851	5.0	26.3	12.2	43.5	11,186
29. Mission-24th	8,542	32,050	3.0	41.4	10.2	54.6	8,070

(continued on next page)

^a Census blocks within one-quarter mile of BART station.

Source: DeLeuw, Cather & Company: Worksheets for BART Impact Population within One Quarter Mile of Stations.

^b Portions of census tracts within one-half mile of BART station.

Source: McGuire, Chester: Who are the Transportation Disadvantaged? (WP), April, 1976.

Table II - 3 (continued)
SELECTED CHARACTERISTICS OF THE POPULATION
1970 CENSUS DATA FOR BART STATIONS

Station	Total Pop- ulation within One- Quarter Mile ^a	Population Within One-Half Mile Radius ^b					Income
		Total Population	Per- cent Black	Percent Spanish Heritage	Per- cent Other	Percent of Total Minority	
30. Mission-16th	8, 481	31, 341	7. 3	37. 6	14. 7	59. 6	\$7, 282
31. Civic Center	4, 559	30, 816	10. 8	11. 3	11. 7	33. 8	6, 306
32. Powell Street	3, 666	21, 829	3. 7	8. 9	15. 9	28. 5	7, 450
33. Montgomery St.	402	25, 919	1. 7	5. 3	50. 2	57. 2	7, 416
34. Embarcadero	621	11, 795	1. 8	4. 9	50. 0	56. 7	9, 387

^a Census blocks within one-quarter mile of BART station.

Source: DeLeuw, Cather & Company: Worksheets for BART Impact Population within One Quarter Mile of Stations.

^b Portions of census tracts within one-half mile of BART station.

Source: McGuire, Chester: Who are the Transportation Disadvantaged? (WP), April, 1976.

Civic Center stations. As a point of reference in interpreting impacts later in this report, it is important to remember that there are far more residents within one-quarter mile of either the 24th or 16th Street Mission stations (high minority concentration) than there are within all of six station areas located along the Concord line (low minority concentration). Similarly, the population within a quarter mile of the two Mission District stations is nearly half of all the seven Richmond line stations and about two-thirds of all of the eleven Fremont line stations.

Of the three major racial ethnic groups considered in this analysis, Blacks are the largest of these groups in the following station areas: West Oakland, Coliseum, MacArthur, Ashby, Richmond, North Berkeley and Daly City. The Spanish-heritage form the largest of the three minority groups in Union City, Mission-24th Street, Mission-16th Street, Fruitvale, Glen Park and Balboa Park, while the "other" category which includes Asians forms the largest population group in the Montgomery Street, Embarcadero and Lake Merritt station areas.

As part of the subsequent analysis, it was necessary to select some classification criterion to differentiate those station areas with "high" from those with "low" ethnic minority concentrations in the surrounding area. Ethnic minorities constitute approximately one-third (32%) of the three county BART area. This Technical Memorandum utilizes a total ethnic minority concentration of forty percent (40%) or more to consider a BART station area to have a high concentration of ethnic minorities. This is consistent with the classification system employed by the Environment Project. The Hayward station is also placed in the high ethnic concentration category due to the high concentration of one ethnic minority (36.3% Spanish heritage; 39.2% total ethnic minority).

Based on this classification scheme, eighteen (18) of the thirty-four (34) BART stations can be considered to be located in areas of high total ethnic minority concentration. Three of these are downtown stations.

There are sixteen (16) station areas of low total ethnic minority concentration. Four of these are located in the downtown areas of San Francisco, Oakland and Berkeley. It should be noted that even though the number of total ethnic minorities may not be high, a specific minority subgroup may be concentrated in the station area to a degree substantially greater than in the three county BART area, e.g. South Hayward (21.7% Spanish heritage) or San Leandro (23.3% Spanish heritage).

Table II-4 and Table II-5 list station areas of high and low total ethnic concentrations respectively and provide an estimate of median household

Table II - 4
STATION AREAS WITH HIGH CONCENTRATIONS
OF ETHNIC MINORITIES

Station	% Total Ethnic Minority Population ^a	Predominant Minority Groups ^b	Income
Oakland West	96.0	Black	\$ 4, 711
Coliseum	95.4	Black	5, 707
Union City	88.0	Spanish	8, 400
MacArthur	77.3	Black	9, 265
Ashby	66.7	Black	7, 756
Fruitvale	62.9	Spanish, Black	7, 108
Mission-16th Street	59.6	Spanish	7, 282
*Montgomery Street	57.2	Other	7, 416
*Embarcadero	56.7	Other	9, 387
Mission-24th Street	54.6	Spanish	8, 070
Daly City	53.2	Black, Spanish	10, 373
*12th Street	51.7	Black, Other	7, 334
*Lake Merritt	49.1	Other	7, 915
North Berkeley	48.2	Black, Other	9, 398
Richmond	45.9	Black, Other	8, 041
Glen Park	43.5	Spanish	11, 186
Balboa	41.1	Spanish	10, 952
Hayward	39.2	Spanish	9, 175

^a Percent total ethnic minority population of total 1970 population within one-half mile of BART station.

^b Specific ethnic minority group exceeds fifteen percent (15%) of total station area population. "Other" is predominantly Asians.

* Downtown Stations.

Source: McGuire, Chester: Who Are the Transportation Disadvantaged, (WP), April, 1976.

Table II - 5
STATION AREAS WITH LOW
CONCENTRATIONS OF ETHNIC MINORITIES

Station	% Total Ethnic Minority Population ^a	Income
*19th Street	35.0	\$ 7,626
*Civic Center	33.8	6,306
El Cerrito del Norte	31.6	13,272
*Powell Street	28.5	7,450
San Leandro	25.5	10,320
South Hayward	24.6	9,562
Rockridge	23.4	8,023
*Berkeley	21.8	7,187
Bay Fair	21.4	10,710
Fremont	17.2	11,167
El Cerrito Plaza	15.5	15,176
Pleasant Hill	9.8	13,346
Concord	9.2	11,215
Walnut Creek	8.5	10,744
Lafayette	5.0	16,400
Orinda	3.7	21,474

^a Percent total ethnic minority population of total 1970 population within one-half mile of BART station.

Source: McGuire, Chester: Who Are the Transportation Disadvantaged, (WP), April, 1976.

income. Again, the reader is cautioned to view this census data with care. Densities, composition of population and income levels have changed since 1970. There is also a tendency to undercount the ethnic minority component of the Bay Area population. In addition, during recent years, a great number of "non-documented" aliens have arrived in the area. Many of these are ethnic minorities who reside in the central cities of San Francisco, Oakland and Berkeley. In the interpretation of impacts, the ITD study uses aggregate census data - block and census tract. Aggregation of data may result in distorting which population groups (ethnic minority or majority) are specifically affected around station areas. The reader should recognize that aggregation of block data results in loss of information and that specific blocks around stations may be unaffected by BART caused impacts. These may or may not contain high concentrations of ethnic minorities.

In Table II - 4, "predominant" specific ethnic subgroup(s) are shown for each station based on the utilization of an indicator of fifteen percent (15%) of total station area population. It can be seen that those stations of the highest total ethnic minority concentration tend to be predominantly Black, with the lowest household income figures.

Tables II - 4 and II - 5 show that income levels for stations classified as high concentrations of ethnic minorities are substantially lower than those for stations located in areas of low total ethnic minority concentrations. Income levels, however, vary widely among station areas. Balboa Park, Glen Park and Daly City station areas all have median household income in excess of \$10,000. The lowest income level is found at the Oakland West (\$4,700). The highest income level of any of the thirty-four BART stations is found in the Orinda station area (\$21,474).

Elderly and Handicapped

Three County BART Area

According to the 1970 Census, the elderly constituted eight percent (8%) of the total population residing within the three-county area in which BART is located. As shown in Table II - 6, there were 196,086 persons sixty-five years or older living in the three-county region in 1970. It can be estimated that approximately fifteen percent of the elderly suffer from some type of mobility impairing handicap.⁷

⁷ U.S. Department of Health, Education and Welfare: Synthetic State Estimates of Disability, Public Health Statistics #1759.

Table II - 6
BAY AREA ELDERLY SUMMARY
POPULATION STATISTICS
(1970 U. S. Census)

Area	Number	Percent of Total Population	Total Population
SMSA (total Bay Area)	295,478	10	3,109,519
3-County BART Area	196,086	08	2,347,247
Alameda County	99,199	09	1,073,184
Contra Costa County	38,778	07	558,389
San Francisco County	58,109	08	715,674
BART LINES*			
Total BART System	82,256	11	744,914
Fremont Corridor	29,347	11	274,014
Concord Corridor	14,272	10	140,750
Richmond Corridor	14,525	11	138,928
Daly City Corridor	24,112	13	190,502

*Includes census tracts within one-quarter mile of BART.

Source: DeLeuw, Cather and Company: BART and Its Environment:
Descriptive Data, (WN), March, 1976.

BART Impact Corridor

In the area within one-quarter mile of the BART system, a somewhat higher percentage of elderly residents is found than in the general distribution throughout the three county area. As shown in Table II - 6, the 82,256 elderly persons living in the BART Impact Corridor represent eleven percent (11%) of the total population within the corridor. Approximately forty-two percent (42%) of the three county area's elderly population live in this corridor as compared to thirty-one percent (31%) for the non-elderly population.

Station Areas

Around station areas, there is considerable variation in the concentrations of elderly. In general, the highest concentrations of elderly occur in downtown Oakland and San Francisco and adjacent areas (Table II - 7). The lowest concentrations of elderly occur in suburban locations. Four of the eight station areas with more than 15 percent elderly also contain high concentrations of ethnic minorities (greater than 40 percent). BART station areas in Orinda, Fremont, Pleasant Hill and South Hayward have the lowest concentrations of elderly.

Composite Profile of Ethnic Minority and Elderly Around Stations

Table II - 9 provides a summary table of all thirty-four BART station areas. The classification of the station area is shown; whether high or low, ethnic or elderly concentration. Stations are also grouped by area type - downtown, urban residential and suburban. Within each group, stations are listed in descending rank order for total population size within area one-quarter mile from the station (density).

The table clearly indicates that ethnic minorities and the elderly tend to live in relatively high density areas in which a given BART related environmental impact will affect a substantially larger population than the same impact would in low density areas. All of the stations with high concentrations of either ethnic minorities or elderly are located in downtown or urban residential areas, with the exception of Union City (no population in immediate station area). Half of the high concentration elderly stations are located in downtown areas. Four station areas have high concentrations of both elderly and ethnic minorities: Civic Center, Mission-16th Street, MacArthur and Lake Merritt.

Figure II - 1 provides a map of the BART system and indicates station areas with high concentrations of ethnic minorities (greater than 40%) and station areas with high concentrations of elderly (greater than 15%). All of the San

Table II - 7
STATION AREAS WITH HIGH
CONCENTRATIONS OF ELDERLY

Station	Percent ^a
*19th Street	30
Rockridge	25
*Civic Center	25
*Powell Street	25
Lake Merritt	15-25
*12th Street	20
MacArthur	15-20
Mission-16th Street	15-20

^a Range estimate from aggregation of block statistics; 1970 census count of persons 65 or older within one-quarter mile of station.

* Downtown Stations.

Source: DeLeuw, Cather and Company: "Population Within One-Quarter Mile of Stations", (Worksheets).

Table II - 8
STATION AREAS WITH LOW
CONCENTRATIONS OF ELDERLY

Station	Percent ^a
Fruitvale	15
San Leandro	15
Hayward	15
El Cerrito Plaza	15
*Montgomery Street	15
Walnut Creek	15
Balboa Park	15
Concord	10-15
Ashby	10-15
Union City	10-15
Mission-24th Street	12
Daly City	10
Glen Park	10
*Embarcadero	10
Lafayette	10
Richmond	10
*Berkeley	10
North Berkeley	10
Bay Fair	10
West Oakland	5-10
El Cerrito del Norte	5-10
Coliseum	5-10
Orinda	5
Fremont	5
Pleasant Hill	0-5
South Hayward	0-5

^a Range estimate from aggregation of block statistics; 1970 census count of persons 65 or older within one-quarter mile of station.

* Downtown Stations.

Source: DeLeuw, Cather and Company: "Population Within One-Quarter Mile of Stations", (Worksheets).

Table II - 9
BART STATION AREAS:
COMPOSITE ETHNIC AND ELDERLY PROFILE

Station	Total Pop. ^a (1/4 mile)	Concentration of Ethnic Minorities ^b		Concentration of Elderly ^c	
		High	Low	High	Low
DOWNTOWN (7)					
Civic Center	4559		x	x	
Berkeley	3795		x		x
Powell	3666		x	x	
12th Street	1795	x		x	
19th Street	1115		x	x	
Embarcadero	621	x			x
Montgomery St.	402	x			x
URBAN RESIDENTIAL (17)					
Mission-24th Street	8542	x			x
Mission-16th Street	8481	x		x	
Glen Park	3574	x			x
Ashby	3116	x			x
North Berkeley	2533	x			x
Rockridge	2381		x	x	
MacArthur	2361	x		x	
West Oakland	2240	x			x
Daly City	2219	x			x
Lake Merritt	2042	x		x	
Balboa Park	1898	x			x
Fruitvale	1856	x			x
Richmond	1756	x			x
El Cerrito Plaza	1607		x		x
El Cerrito del Norte	936		x		x
San Leandro	904		x		x
Coliseum	675	x			x

(continued on next page)

^a Source: DeLeuw, Cather & Company: "Population Within One-Quarter Mile of Stations", (Worksheets).

^b From Tables II - 4 and II - 5; High Concentration, more than 40% total ethnic minority.

^c From Tables II - 7 and II - 8; High Concentration, more than 15% elderly.

Table II - 9 (continued)

BART STATION AREAS:
COMPOSITE ETHNIC AND ELDERLY PROFILE

Station	Total Pop. ^a (1/4 mile)	Concentration of Ethnic Minorities ^b		Concentration of Elderly ^c	
		High	Low	High	Low
SUBURBAN (10)					
South Hayward	1763		x		x
Bay Fair	1283		x		x
Concord	997		x		x
Pleasant Hill	785		x		x
Walnut Creek	763		x		x
Hayward	756	x			x
Lafayette	727		x		x
Orinda	298		x		x
Union City	0	x			x
Fremont	0		x		x

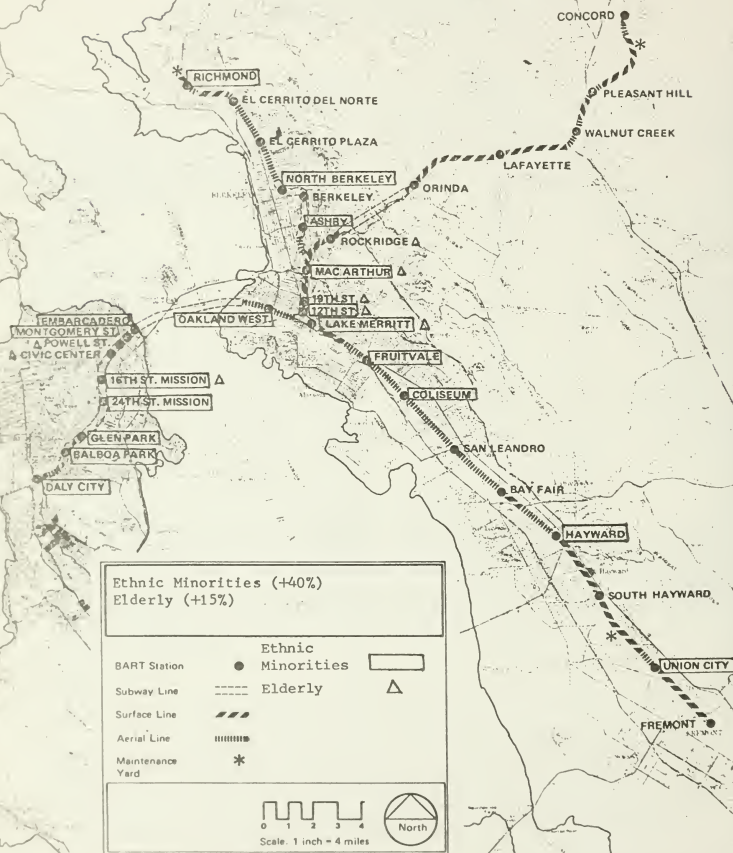
^a Source: DeLeuw, Cather & Company: "Population Within One-Quarter Mile of Stations", (Worksheets).

^b From Tables II - 4 and II - 5; High Concentration, more than 40% total ethnic minority.

^c From Tables II - 7 and II - 8; High Concentration, more than 15% elderly.

Figure II-1

BART STATION AREAS WITH HIGH CONCENTRATIONS OF THE
TRANSPORTATION DISADVANTAGED



SOURCE: Urban Dynamics Associates, Gruen Associates

Francisco and Oakland station areas are populated with high concentrations of ethnic minorities and/or the elderly. The North Berkeley, Union City, Richmond, Hayward and the Daly City station areas are also populated by high concentrations of ethnic minorities.

III. INVESTIGATION OF ENVIRONMENTAL IMPACT ISSUES

Method for Determining BART's Implications for the Transportation Disadvantaged

Each of the six issues designated for investigation of BART's environmental impacts will be reviewed and interpreted in the following manner: First, applicable impact assessment sources are identified. Results of the Environment Project are augmented by findings from the Transportation System and Travel Behavior Project, Institutions and Lifestyles Project, and Public Policy Project for this issue interpretation. Secondly, the specific environmental impacts of each issue are discussed system-wide. This is followed by a discussion of impacts for station and line segment areas where high and low concentrations of disadvantaged reside in the surrounding area. Where applicable, results of the Environment Project's community surveys are included.

One of the principal sources of information used in this report is the Environment Project's survey of selected areas of residents living within four blocks of the BART system.⁸ Home interviews were conducted in a total of 700 households located in three station areas and seven line segment sites, representing varying BART configuration and site characteristics. The purpose of this study was to determine the perceptions and attitudes of persons exposed to BART's environmental impacts - both construction and operational. The study provides information on how different types of impacts are perceived, the intensity of impact with respect to distance from source, and how different population groups respond to similar impact stimuli. The most important conclusion of this study for the ITD Project is that there is no evidence that BART related environmental impacts of comparable type and intensity are in fact perceived differently among ethnic and economic subgroups of the population.

Environmental Impact Issues

In order to determine the implications of BART's environmental impacts for the transportation disadvantaged, six specific issues have been designated for investigation using information developed in the BART Impact Program and other BART studies.⁹ The six environmental issues examined

⁸ Gruen Associates and DeLeuw, Cather & Co.: Responses of Nearby Residents to BART's Environmental Impacts, (TM), January, 1977.

⁹ Urban Dynamics Associates: Project Implementation Plan: BART's Implications for the Transportation Disadvantaged, September, 1977.

in this report are:

1. BART has significantly reduced the quality of life in ethnic minority residential neighborhoods around the stations by:
 - creating parking problems,
 - increasing automobile congestion, and
 - increasing traffic safety hazards.
2. BART noise and environmental intrusion, e.g. vibration, and loss of privacy, are especially strong negative factors around line segments in ethnic minority areas.
3. BART tracks are a barrier as they pass through ethnic minority communities.
4. Personal security of BART users may be a problem, particularly during evening hours. There may be differences in the level of surveillance and protection in minority areas and differences in the way minorities, the elderly and the handicapped perceive personal security.
5. BART construction activities caused greater disruption in ethnic minority communities over a more prolonged time period than in non-minority communities. Upon completion of BART, adverse long-term environmental effects were less in minority than non-minority communities.
6. BART has improved the environmental quality of communities around stations because of related street improvement projects, beautification programs, parks and landscaping, including passive and active recreational facilities.

BART has significantly reduced the quality of life in ethnic minority residential neighborhoods around the stations by:

- creating parking problems,
- increasing automobile congestion, and
- increasing traffic safety hazards.

Four data sources were reviewed to determine and interpret motor vehicle related impacts:

- Technical Memoranda (TM), Working Notes (WN), Working Papers (WP) and the Draft Final Report of the Environment Project.
- Passenger Profile Survey of 1976.
- BART Station Case Studies (TSTB Project).
- San Francisco and Daly City BART Overflow Parking License Plate Surveys.

These were supplemented, to a lesser extent, by field observations and other data sources.

Parking Problems

Parking facilities for BART patrons are provided at twenty-three (23) stations. This includes all stations except those located within the City of San Francisco and the downtown areas of Oakland and Berkeley. Ten stations within areas of high concentrations and thirteen stations within areas of low concentrations of ethnic minorities have parking facilities. Use of BART parking facilities is estimated by field surveys and the Passenger Profile Survey (PPS). The Environment Project reported a BART parking survey conducted in January, 1975. This survey indicated that overflow parking conditions existed in nine station areas. Four (4) of these are in station areas with high concentrations of ethnic minorities (Table III - 1) and five (5) are located in areas with low concentrations of ethnic minorities (Table III - 2).

Because of differences in data sources and collection procedures, as shown in Tables III - 1 and III - 2, conclusions regarding the trend in overflow parking conditions around BART stations are necessarily tentative. However, these data show that for those station areas where comparable data are available, there appears to be an increasing overflow parking problem associated with increasing use of BART since January, 1975. This is clear for the Glen Park, Walnut Creek and Concord station areas. Of particular

Table III-1
BART STATIONS WITH OVERFLOW PARKING
IN AREAS OF HIGH CONCENTRATIONS
OF ETHNIC MINORITIES

Station	Parking Lot Capacity	Source A Overflow	Source B Overflow	Source C Overflow
Daly City	820	1,000	+858 ^a	650
*Glen Park	0	350	520	650
Union City	477	350	Not Available	Not Available
*Balboa Park	0	<u>300</u>	Not Available	Not Available
TOTAL		2,000		

Source A: Gruen Associates, Inc. Impacts of BART on the Social Environment: Interim Service Findings. (Final Report). March, 1976 (reflects counts as of January, 1975).

Source B: License plate surveys undertaken by Public Works Departments, San Francisco and Daly City, 1976-77.

Source C: Peat, Marwick, Mitchell & Co. BART Station Access Case Studies (WN). April, 1977.

^a Excludes a BART impacted San Francisco neighborhood northeast of the station.

* No BART parking provided off-street.

Table III - 2
BART STATIONS WITH OVERFLOW PARKING
IN AREAS OF LOW CONCENTRATIONS
OF ETHNIC MINORITIES

Station	Parking Lot Capacity	Source A Overflow	Source C Overflow
Fremont	700	550	511
Walnut Creek	1, 114	150	486
Lafayette	650	150	Not Available
Concord	1, 059	100	711
Pleasant Hill	1, 337	<u>100</u>	Not Available
		1, 050	

Source A: Gruen Associates, Inc. Impacts of BART on the Social Environment: Interim Service Findings. (Final Report).
March, 1976 (reflects counts as of January, 1975).

Source C: Peat, Marwick, Mitchell & Co. BART Station Access Case Studies (WN). April, 1977.

concern is the Glen Park and Balboa Park situation, where no off-street parking facilities have been provided by BART. Both of these stations are non-terminal stations, located in urban residential neighborhoods classified as high minority concentration areas. All parking for these stations occurs on adjacent streets, which are characterized by low density, single family residential development, schools and other institutions. Union City overflows occur in a vacant area, planned for the future as a commercial center.

For station areas with low concentrations of ethnic minorities, overflow from the Fremont station affects an undeveloped area. Overflow parking from Walnut Creek, Lafayette, Concord and Pleasant Hill affect developed or partially developed suburban neighborhoods.

It is important to note that the residential response study found that overflow parking was perceived as the most serious BART related environmental impact in both of the two station areas included in the sample with overflow parking conditions - Daly City (minority) and Concord (majority). These effects did not diminish significantly with distance from the station within the four-block depth in either site, suggesting major effects on many people.¹⁰

As a result of the overflow parking problems, three types of public and community response can be observed:

- Provision of additional BART off-street parking facilities;
- Community support for restrictive neighborhood parking programs; and
- Increased Bus Feeder service.

Increased BART Parking Supply

BART is effectively doubling the parking capacity of the Daly City station with the construction of a 780 space garage.¹¹ This should reduce overflow into the adjacent areas. On the other hand, more parking at this location may attract more BART riders to drive to the station. BART parking at the Hayward and Union City stations is also being increased by 200 and 300 additional spaces, respectively.

¹⁰ Gruen Associates and DeLeuw, Cather & Co. : BART and Its Environment: Descriptive Data (WN), March, 1976.

¹¹ Gruen Associates and DeLeuw, Cather & Co. : BART and Its Environment: Descriptive Data, (WN), March, 1976.

Neighborhood Restrictive Parking Programs

Preferential parking zones implemented within areas of high concentrations of ethnic minorities should constrain BART access by auto patrons over the next year. The preferential parking plan is a neighborhood response to all-day commuter parking in residential areas throughout California. Residents can petition their city or the county (if an unincorporated territory) to establish a preferential parking plan. In San Francisco, many residents in virtually all residential neighborhoods which contain BART stations or regional institutions are actively pursuing this alternative as a solution to motor vehicle related impacts.

In September, 1976, sixty-one percent (61%) of the residents of the St. Charles Avenue area north of the Daly City BART station petitioned the Board of Supervisors of San Francisco for preferential parking. The City Traffic Engineering Division completed a license plate survey of the neighborhood in March, 1977.¹² The Division concluded that 108 (88%) of the 123 vehicles parked in a seven (7) block area were commuter vehicles (registered to owners not residing in the area). The commuter vehicles were further analyzed: 13 were from within San Francisco, but outside the St. Charles Avenue area; 85 were from outside San Francisco, but within commuting distance and 10 were from other locales. The study also found that 104 of the 108 commuter vehicles were parked for long-term periods (4 hours or more). Subsequently, the City has held a hearing, issued permits, installed signs, and formally initiated the commuter restrictive, neighborhood resident preferential parking program effective August, 1977.

A similar pattern of BART related parking impacts has been observed in the vicinity of the Glen Park station where there is also community interest in preferential parking programs to restrict commuter parking. A Glen Park license plate survey in November, 1975 found that less than one percent of the vehicles for a one-quarter mile area around the station were registered to residents of that area. Nine percent were registered to residents within one-half mile of the BART station. More than half are residents living within one and one-half miles; a quarter are San Francisco residents who reside more than 1-1/2 miles from the station and a fifth are owners who reside south of San Francisco. Vehicles parked on streets near the station

¹² San Francisco Department of Public Works, Traffic Engineering Division: Report on Preferential Parking for the Saint Charles Avenue Area, March, 1977.

have doubled since BART initiated service. These are directly attributable to BART users.¹³

Preferential parking petitions are also being circulated by residents around the Glen Park, Balboa Park, and the two Mission District BART stations. Should the petitioners achieve preferential parking in these BART affected neighborhoods, a substantial, but unknown, number of long-term on-street parking spaces used by BART patrons could be removed in San Francisco and Daly City.

Increased Bus Feeder Service

In July, 1977 the San Mateo Transit District substantially increased the level of feeder bus service to the Daly City station. There are currently one hundred twenty-eight (128) buses scheduled daily from the Southern Peninsula area to the Daly City BART station, approximately doubling prior service levels. While this improvement in feeder bus service cannot be seen as a direct response to parking problems in the Daly City station area, the change in service levels will provide an opportunity to test the improved bus feeder option as a means of reducing parking and other auto access related impacts in station areas.¹⁶

Automobile Congestion

BART patrons use a variety of transportation modes to and from BART stations. These include:

- Drive alone;
- Carpool;
- Dropped off by auto driver;
- Bus or Streetcar; and
- Other (motorcycle, bicycle and walking).

¹³ San Francisco Department of Public Works, Bureau of Engineering: Glen Park Parking Survey, November, 1975.

¹⁶ A parking lot utilization count conducted by BART in the week of July 25th, shows less than capacity use in the Daly City station off-street lot (99.3%). However, this only represents six vacant spaces and does not provide any indication that long term on-street BART parkers have changed their parking habits or have shifted to the bus access mode.

It can be expected that location of a BART station within a given area will increase total travel to and from the area. Depending on the mix of access modes used by the BART users, the impacts of these increased person trips in the area will range markedly. Where auto usage (drive alone, dropped-off, and carpool) is predominant, a higher level of congestion, parking, traffic safety and air pollution impacts may be expected.

In the following tables, an indicator of the relative level of auto usage by BART rides is developed for downtown stations (Table III-3), urban residential and suburban stations in high concentration ethnic minority areas (Table III-4), and urban residential and suburban low concentration ethnic minority areas (Table III-5). The "Index of Auto Use by BART Riders in Station Areas" is a statistic which provides a measure of the degree of auto-access impact around a BART station relative to other stations. It is not the "best" estimate of total BART related peak parking for a specific station site.

In general, downtown stations are heavily patronized, mostly by those who walk or arrive by bus to enter the BART station. As shown in Table III-3, auto access is very low in downtown stations; an average of less than thirteen percent (12.6%) of total person trips entering the BART station. It can be concluded that BART induced auto travel in these stations is minimal and associated environmental impacts are negligible.

As shown in Table III-4 and III-5, the number of entrants at stations within areas of high or low concentrations of ethnic minorities is about the same outside downtown. The automobile is the chief means of access for both of these categories. Approximately half (50.8%) of the arrivals at stations with high concentrations of ethnic minorities used the automobile (drive alone, carpool, or dropped off). This compares with more than seventy percent (71.5%) for station areas with low concentrations of ethnic minorities. Within mode categories, the percentage who "drove alone" is far greater in station areas with low concentrations of ethnic minorities. The number of patrons who enter BART by using bus or by walking was much greater in station areas with high concentrations of ethnic minorities.

Comparing the average Index of Auto Use for both low and high ethnic concentration areas (1,084/760), it is clear that in general, suburban majority areas are experiencing higher levels of BART related auto traffic congestion than minority areas which are located in urban residential areas. Three important exceptions to this general conclusion are Daly City, Balboa Park and Glen Park where the Index of Auto Use exceeds the average of the areas of low minority concentrations.

Using the selected station case study approach, the Environment Project

Table III - 3
INDICATORS OF AUTO TRAFFIC IMPACTS IN
STATION AREAS: DOWNTOWN STATIONS

Station	1 Entering First Leg of Trip ^a	Auto Access Mode			5 Index of Auto Use by BART Riders in Station Area ^c
		2 Percent Drive Alone	3 Percent Carpool ^b	4 Percent Dropped off	
Berkeley	1,603	4.3%	0.0%	4.5%	141
19th Street	1,244	11.5	2.1	8.2	271
12th Street	1,024	7.5	.5	5.2	135
Civic Center	1,433	5.3	.4	2.8	122
Powell	2,081	3.2	.5	4.5	171
Montgomery	1,388	3.9	.7	5.6	142
Embarcadero	N/A	N/A	N/A	N/A	N/A
Total	8,773				982
Average	1,462	6.0	.7	5.1	164

^a The number of BART travelers entering the BART station from 6:00 a. m. to 3:00 p. m. and from 7:00 p. m. to Midnight who are making the first leg of a round trip.

^b Percentage in table is half the number reported by the 1976 PPS. This number reflects an assumption of two persons per carpool.

^c Sum of columns 2, 3 and 4 times column 1.

Source: Peat, Marwick & Mitchell: BART Station Access Case Studies (WN), April, 1977. 1976 Passenger Profile Survey.

Table III - 4
INDICATORS OF AUTO TRAFFIC IMPACTS
IN STATION AREAS: HIGH CONCENTRATIONS
OF ETHNIC MINORITIES

Station	1 Entering First Leg of Trip ^a	Auto Access Mode			5 Index of Auto Use by BART Riders in Station Area ^c
		2 Percent Drive Alone	3 Percent Carpool ^b	4 Percent Dropped off	
Richmond	811	27.9	2.6	16.5	381
North Berkeley	1,013	30.2	1.4	9.2	413
Ashby	752	20.9	2.6	9.7	250
Union City	1,455	56.1	3.8	12.6	1,055
Coliseum	880	34.1	1.7	13.8	436
Fruitvale	1,433	42.2	2.2	11.9	807
Lake Merritt	1,078	28.2	2.8	17.9	527
MacArthur	1,033	37.6	2.6	13.1	551
Oakland West	945	59.1	5.3	14.9	749
Daly City	4,615	21.8	3.3	27.3	2,418
Balboa Park	2,325	25.3	3.4	23.1	1,204
Glen Park	2,654	22.8	2.3	21.5	1,237
Mission-24th St.	1,533	2.6	1.1	5.9	147
Mission-16th St.	1,075	6.8	0.7	10.6	195
Hayward	1,604	45.3	3.0	15.6	1,025
Totals	23,206		-		11,395
Averages	1,547	30.7	2.6	14.9	760

^a The number of BART travelers entering the BART station from 6:00 a. m. to 3:00 p. m. and from 7:00 p. m. to Midnight who are making the first leg of a round trip.

^b Percentage in table is half the number reported by the 1976 PPS. This number reflects an assumption of two persons per carpool.

^c Sum of columns 2, 3 and 4 times column 1.

Source: Peat, Marwick & Mitchell: BART Station Access Case Studies (WN), April, 1977. 1976 Passenger Profile Survey.

Table III - 5
INDICATORS OF AUTO TRAFFIC IMPACTS
IN STATION AREAS: LOW CONCENTRATIONS
OF ETHNIC MINORITIES

Station	1	2		3	4	5
	Entering First Leg of Trip ^a	Auto Access Mode			Percent Dropped off	Index of Auto Use by BART Riders in Station Area ^c
		Percent Drive Alone	Percent Carpool ^b			
Concord	3,033	44.7	4.8		22.6	2,187
Pleasant Hill	1,755	45.4	4.1		22.1	1,257
Walnut Creek	2,090	46.3	4.7		18.1	1,444
Lafayette	1,355	53.9	5.8		20.9	1,092
Orinda	1,278	59.9	5.6		20.1	1,094
Rockridge	1,118	36.3	3.2		8.3	534
El Cerrito del Norte	1,358	48.2	5.2		11.1	876
El Cerrito Plaza	1,042	29.5	2.4		9.4	430
Fremont	2,019	50.7	6.2		12.3	1,397
South Hayward	1,094	45.3	3.3		22.9	782
Bay Fair	1,742	50.6	5.7		14.8	1,239
San Leandro	1,079	41.6	4.3		16.5	673
Totals	18,963					13,005
Averages	1,580	46.0	4.5		16.5	1,084

^a The number of BART travelers entering the BART station from 6:00 a. m. to 3:00 p. m. and from 7:00 p. m. to Midnight who are making the first leg of a round trip.

^b Percentage in table is half the number reported by the 1976 PPS. This number reflects an assumption of two persons per carpool.

^c Sum of columns 2, 3 and 4 times column 1.

Source: Peat, Marwick & Mitchell: BART Station Access Case Studies (WN), April, 1977. 1976 Passenger Profile Survey.

examined traffic related impacts and their perception by residents in the Concord (majority) and Daly City (minority) station areas. Both these station areas are typical of areas in which prior traffic levels were low; it is concluded that substantial BART related auto traffic problems have resulted.¹⁴ Analysis of the perceptions and responses of the residents of the Concord and Daly City station areas indicates high levels of dissatisfaction with BART's effects on traffic congestion and parking.¹⁵ About one-third of those interviewed reported behavioral changes in reaction to BART related traffic congestion.

Traffic Safety Hazards

The Environment Project investigated traffic accidents in relation to parked cars on nearby streets, moving vehicles on nearby streets, and pedestrian and vehicle movements in BART parking lots. The study concluded that significant BART-related increases in accidents involving parked cars were found only near the Daly City neighborhood (an area of high concentrations of ethnic minorities). Moving vehicle conflicts occurred at six (6) station areas (two of these contain areas with high concentrations of ethnic minorities). Although some station lots have the potential for creating accidents, the number of reported incidents was generally found to be insignificant. However, analysis of nearby residents indicates that a majority of the residents in both the Concord and Daly City station areas perceive increased safety problems as the result of BART induced traffic increases.

Conclusion

The principal negative environmental impact caused by BART's operation is induced commuter auto traffic within station areas. The extent of traffic related problems is a function of both the level of auto use by BART riders to and from the station and the areas physical and social environment. Most BART provided parking facilities are located in suburban areas and urban residential areas with low to moderate concentrations of ethnic minorities. Most of the auto-related environmental impacts are occurring in these areas. Five of the seven station areas experiencing overflow from BART provided parking are located in majority areas. However, Daly City, a terminal station located in an urban residential area of relatively high ethnic minority

¹⁴ Gruen Associates, Inc. and DeLeuw, Cather & Company: Impact of BART on the Social Environment (TM), March, 1976.

¹⁵ Gruen Associates, Inc. and DeLeuw, Cather & Company: Response of Nearby Residents to BART's Environmental Impacts (TM), January, 1977.

population, is experiencing serious overflow parking impacts. The minority station areas of Glen Park and Balboa Park in San Francisco are also experiencing BART induced auto impacts, including on-street parking by BART users since there is no BART provided parking at those stations. Auto access impacts of BART can be expected to increase in the future with growing BART ridership, unless improved feeder bus service and/or changes in BART parking policy would reduce current levels of station auto access use. Also, community support for neighborhood permit parking programs may lead to preferential parking regulations which restrict BART related off-street parking in areas where overflow parking is a serious problem.

BART noise and environmental intrusion, e.g. vibration, and loss of privacy, are especially strong negative factors around line segments in ethnic minority areas.

Noise Levels

In order to investigate and interpret this issue, BART noise generation was compared with ambient community noise levels. Technical measurements completed as a part of the Environment Project and results from the neighborhood response survey indicate that BART noise is noticeable and potentially troublesome to residents living near some of BART's aerial segments.¹⁷ These segments exist primarily in suburban areas with low concentrations of ethnic minorities. Along ten percent (10%) of the system's route, or seven miles of BART trackways, the daytime sound of BART was found to exceed background sound levels by at least 5 dB (A) (perceptible), but not more than 12 dB (A) (substantial). This effect diminishes with distance, and impacts primarily on dwellings which lie within 250 feet or one block from the trackway. Because of lower community sound levels at night, BART sound levels may exceed the background levels in these same areas by up to 17 db (A) extending impacts to 500 feet. Many residents within one or two blocks of BART's aerial line have reported some adverse effects due to train sound. Along the at grade segments of BART, impacts have been small. Along subway lines, where many elderly people and ethnic minorities reside, there have been no operational impacts.

The ITD Project compared BART-generated noise between communities with high and low concentrations of ethnic minorities. The accompanying Figure III-1 indicates the noise impacts of BART on adjacent communities. The patterned band depicts the range of mean community Ld in dB (A) at 50 feet from the track, while the heavy line indicates BART generated noise at 50 feet. Stations with large concentrations of ethnic minority residents are underlined.

¹⁷ Gruen Associates, Inc. and DeLeuw, Cather & Company; Response of Nearby Residents to BART's Environmental Impacts (TM), January, 1977.

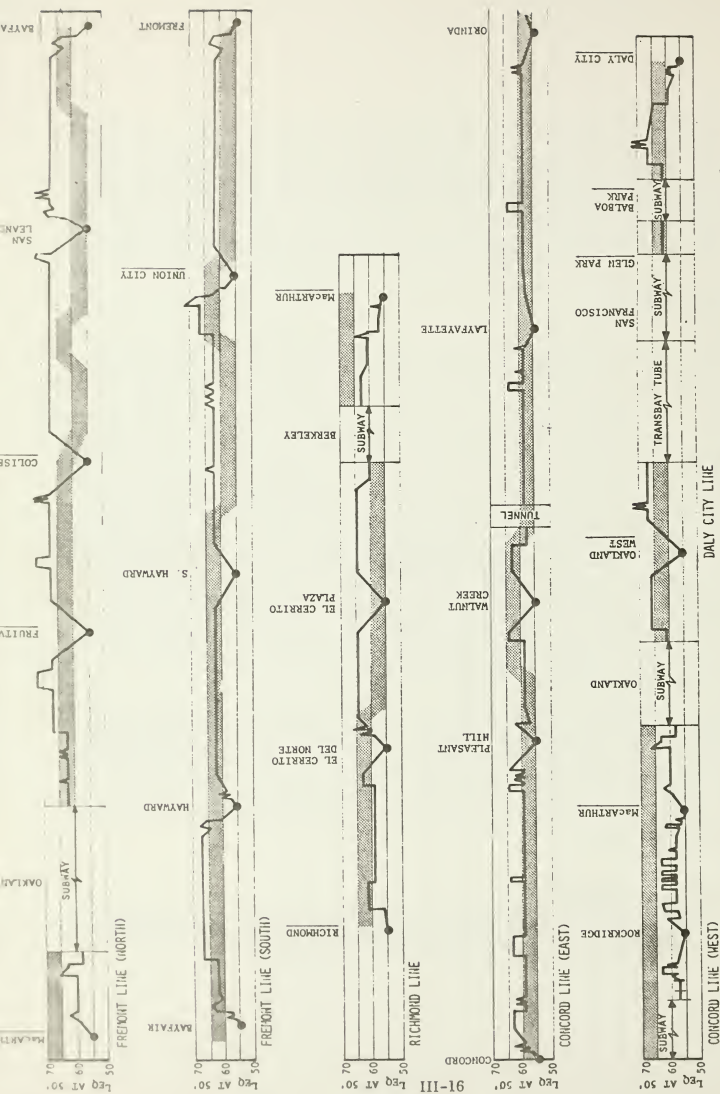


Figure III-1

SOURCE: Gruen Associates, "The Environmental Project", BART Impact Program.

BART AND COMMUNITY NOISE LEVELS

Along the Fremont line, BART noise impacts are less than the mean community noise in dB (A), as they are in the MacArthur station area (undoubtedly due to high freeway traffic noise). In general, noise increases with train speed and is more pronounced along aerial segments. Noise levels decrease with lower speeds near stations. BART noise levels are slightly greater than the ambient noise levels near the Fruitvale, Coliseum and Union City station areas. Along the Richmond line, the ambient noise level is generally higher than the noise generated by BART within the ethnic minority communities. Berkeley's decision to place the BART track underground resulted in no noise impacts along the BART corridor in this city. In adjacent Oakland, the location of BART within the medians of Grove Avenue and the Grove Shafter Freeway result in train noise being suppressed by the much higher ambient noise level caused by adjacent roadway traffic. No large groupings of ethnic minorities occur along the Concord line north-east of Rockridge. Along the Daly City line, an impacted area occurs primarily between the downtown Oakland stations and the transbay tube (east and west of the West Oakland station). Within San Francisco, the noise generated by BART is roughly equivalent to the ambient community noise levels except for the very small portion of BART's elevated line which is southwest of the Balboa Park station.

Vibration

BART trains cause vibration which is perceptible, but probably will not cause damage within a block of aerial lines. According to instrument measurements, vibration levels were not noticeably greater for BART train pass-bys than for vehicle traffic on adjacent streets. Accordingly, no vibration problems were found around stations.¹⁸ As with sound, this impact was confirmed by the results of the nearby residents response survey.

Loss of Privacy

Loss of privacy due to rear yards of homes being exposed to view from passing trains has also been analyzed. This intrusion results from the construction of BART aerial sections in residential areas. It affects

¹⁸ Gruen Associates, Inc. and DeLeuw, Cather & Company: Environmental Impacts of BART: Interim Service Findings, (Final Report), January, 1976.

areas which are populated primarily by low concentrations of ethnic minorities. Where this occurs, survey response indicate that this is not a particularly objectionable BART feature.

Conclusion

From comparisons of noise levels throughout the length of the seventy-one (71) mile BART system and the effects on selected population groups, those areas which are populated by high concentrations of ethnic minorities experience less impact from noise, vibration, and loss of privacy, than non-minority station areas and line segments. Factors responsible for this include: the use of subways in Oakland, San Francisco and Berkeley; the location of BART line segments adjacent to frequently used railroad lines; and the location of BART lines within or adjacent to freeways and major thoroughfares. Within the latter two locations, the ambient noise levels are higher than those generated by BART.

BART tracks are a barrier as they pass through ethnic minority communities.

In order to interpret this issue, the ITD Project has reviewed the location of BART line segments in relation to motor vehicle and pedestrian closures, and the placement of BART in relation to adjacent land uses and transportation facilities. Barrier effects caused by BART induced overflow parking have also been examined.

Barrier Effect

BART has caused few new physical barriers for pedestrians or vehicles. This results from the placement of much of the BART line parallel to other transportation rights-of-way or in aerial or underground configurations. Of the 300 streets which BART crosses, only 12 have been closed.¹⁹ For some of these, street closures have tended to have positive effects by blocking through traffic from local streets. Regarding aerial trackway sections, no physical barriers resulted. Additionally, aerial configurations were used where many crossing points were required. Lines were placed at grade in the relatively undeveloped areas or alongside or within free-way medians. Because trackways were fenced, neighborhood and train safety often resulted. This resulted in pedestrian cross-traffic being blocked for approximately 12 miles. In several instances, attempts were made to re-establish these pedestrian routes. Pedestrian bridges have been built in the vicinity of Richmond and Hayward in response to early problems with people cutting the BART fence to walk across the tracks. Apparently, this has stopped virtually all trespassing onto the BART right-of-way. No injuries to trespassers have been reported and only a few complaints concerning BART barrier effects have been registered.²⁰

BART's potential barrier effects in relationship to adjacent transportation facilities is included within Tables III-6 and III-7. They indicate that

¹⁹ Gruen Associates, Inc. and DeLeuw, Cather & Company: Environmental Impacts of BART (Final Report), July, 1977.

²⁰ Ibid.

Table III - 6
TRANSPORTATION FACILITIES ADJACENT TO
BART: SUMMARY

Description	<u>Total BART System</u>	
	Miles	Percent of System
Separate right-of-way	12. 12	17. 1
Arterial median	8. 93	12. 6
Arterial alongside	13. 85	19. 5
Freeway median	10. 07	14. 2
Freeway alongside	5. 83	8. 2
Railroad alongside	<u>20. 14</u>	<u>28. 4</u>
TOTAL MILES	70. 94	100. 0

Source: DeLeuw, Cather & Company: BART and Its Environment:
Descriptive Data (WN), March, 1976.

Table III - 7

TRANSPORTATION FACILITIES ADJACENT TO
BART: LINE SEGMENTS IN HIGH AND LOW
ETHNIC CONCENTRATION AREAS

Description	High Ethnic Areas: Line Segments	Percent of Total	Low Ethnic Areas: Line Segments	Percent of Total
Separate right-of-way	3	13.1	4	20.0
Arterial alongside	4	17.4	2	10.0
Railroad alongside	5	21.7	9	45.0
Freeway alongside	5	21.7	2	10.0
Freeway median	1	4.4	3	15.0
Arterial median	5	<u>21.7</u>	0	<u>0</u>
		100.0		100.0

Source: DeLeuw, Cather & Company: BART and Its Environment:
Descriptive Data (WN), March, 1976.

nearly sixty-three percent (63%) of the BART system is placed alongside major transportation facilities (freeways, railroads, or major arterials). BART planners chose to locate tracks within or alongside an arterial or freeway (55% of the system's length), alongside railroads (28%) and within separate rights-of-way (only 17%). The location of BART adjacent to railroads, freeways and other major limited access arterials has substantially reduced the potential barrier impacts of BART as a physical barrier dividing communities. However, where arterials and separate rights-of-way were used, major barrier impacts occurred throughout the construction period.²¹ These are non-existent since the completion of the system.

Land uses adjacent to BART lines were examined to determine the creation of potential new barriers or the reinforcement of existing barriers. Of special interest was whether BART tracks were placed within similar uses. As shown in Table III-8, BART tracks were placed between residential and non-residential or within non-residential uses a total of 53 percent of the entire length of the system. These percentages are even higher for the Fremont, Richmond and Daly City lines where there are high concentrations of ethnic minority residents. Furthermore, where BART traverses single-family and multiple-family residential areas as along the Daly City and Richmond lines, BART tracks are primarily located underground.

There is overflow parking from a number of lots and heavy on-street parking for two stations without parking lots (Glen Park and Balboa Park). BART stations lots which lack sufficient parking space to accommodate the need are: Daly City, Concord, Fremont, Walnut Creek, Lafayette and Pleasant Hill. Around station areas, BART induced on-street parking is perceived by many residents as a "barrier". Residents believe parking blocks them from getting to places within their neighborhood. This was indicated by thirty percent (30%) of the residents in the Daly City station neighborhoods and fifty percent (50%) adjacent to the Concord station.²² While response survey results are only available for the Daly City and Concord station areas, it is likely that overflow parking is perceived as a "barrier" in the other areas affected as well.

²¹ Gruen Associates, Inc. and DeLeuw, Cather & Company: Environmental Impacts of BART: Interim Service Findings (Final Report), January, 1976.

²² Gruen Associates, Inc. and DeLeuw, Cather & Company: Response of Nearby Residents to BART's Environmental Impacts (TM), January, 1977.

Table III - 8
BART AND ADJACENT LAND USE

Line	M/ M*	M/S	M/O	S/S	S/O	O/O	Total
Fremont							
<u>Total Linear Ft.</u>	4,000	10,800	6,400	36,400	45,600	32,800	136,000
Miles	0.75	2.04	1.21	6.89	8.63	6.21	25.73
Percent of Total	2.9	7.9	4.7	26.8	33.5	24.1	99.9
Concord							
<u>Total Linear Ft.</u>	--	11,600	6,800	35,600	34,000	12,400	100,400
Miles		2.20	1.29	6.74	6.44	2.35	19.02
Percent of Total		11.6	6.8	35.5	33.9	12.4	100.2
Richmond							
<u>Total Linear Ft.</u>	1,600	14,800	7,200	24,800	4,400	4,000	56,800
Miles	.30	2.80	1.36	4.70	.83	.76	10.75
Percent of Total	2.8	26.0	12.7	43.7	7.8	7.1	100.1
Daly City							
<u>Total Linear Ft.</u>	13,000	--	7,600	22,400	2,400	36,000	81,400
Miles	2.50		1.44	4.24	.45	6.82	15.45
Percent of Total	16.2		9.3	27.4	2.9	44.1	99.9
TOTAL BART SYSTEM							
MILES	3.55	7.04	5.30	22.57	16.35	16.14	70.95
Percent of Total	3.6	9.9	7.5	31.8	23.0	22.7	98.5

* / Separates land use on each side of BART.

M - Multi-family residential; S - Single family residential; O - Nonresidential.

Source: Aerial Photographs (1972 pre-BART Series), USGS Land Use Maps (1970), Gruen/DeLeuw, Cather field observations.

Conclusions

BART tracks are not a barrier as they pass through ethnic minority communities. The placement of BART adjacent to major roadways, within arterial medians or underground, reduces or eliminates the potential barrier effect of line segments. Furthermore, BART divides differing and often incompatible rather than similar land uses. Where similar land uses are traversed, BART is located within a subway configuration, minimizing the long-term effect on users of the adjacent land uses. Where BART has been fenced, beneficial safety and security effects have resulted. Pedestrian traffic has been channeled over potentially dangerous railroad rights-of-way with pedestrian bridges.

BART overflow parking is generally perceived as a nuisance by a majority of residents in BART station areas where the problem exists. A substantial number of residents are found to also perceive overflow parking as a "barrier". This was found to be true in the Daly City station area, the only station area with high ethnic concentration. Since densities are greater in areas with high concentrations of ethnic minorities, a larger population in these communities may be subject to parking impacts perceived as "barrier" effects.

ISSUE NUMBER FOUR

Personal security of BART users may be a problem, particularly during evening hours. There may be differences in the level of surveillance and protection in minority areas and differences in the way minorities, the elderly and the handicapped perceive security.

In order to interpret this issue, results from the Environment Project were reviewed and BART police summary crime reports were analyzed for stations within areas of high and low concentrations of ethnic minorities.²³

Impact on Crime

According to the Environment Project, crime rates in BART parking lots, plaza and station areas are very low.²⁴ This conclusion is drawn from data collected subsequent to the initiation of evening service. During early 1976, crimes and related incidents were reported to have occurred in BART operated parking lots and plaza areas at the rate of about six (6) per day (about one for every 10,000 patrons). Crime against individuals in parking lots, plazas, stations and trains are very rare (less than 4% of the reported incidents). On the other hand, auto-related crimes including car break-ins and thefts are more frequent. These have been increasing since BART operations began. However, as of early 1976, only one (1) out of every 5,500 parked automobiles was subject to crime. Because approximately 14,700 autos are parked in BART lots each day, only about three (3) incidents occur daily systemwide (about one per week in a typical lot). According to the Environment Project, the following are believed to be responsible factors for holding crime rates low:

- Most parking lots are flat, and are easily visible from adjacent streets;
- The landscaping of the station and parking lots usually does not interfere with visibility; and
- Lots are well lighted.

²³ BART, Police Services Department: "Reports of Offenses and Miscellaneous Reports," 1975 and 1976.

²⁴ Gruen Associates, Inc. and DeLeuw, Cather & Company: Environmental Impacts of BART: Interim Service Findings (Final Report), January, 1977.

Within station and platform areas, very low crime rates have been reported. Although the response survey indicates that Mission Street station patrons in particular voice concerns about being subject to crime,²⁵ crime data for this area does not appear to support this concern.²⁶

Before and After Evening Service

Both BART police and a consultant²⁷ to the Environment Project assert that night service has not resulted in increased crime and loss of safety in ethnic minority station areas. The accompanying Table indicates police records of reported incidents which may have an effect on personal security. Table III-9 includes stations which are located in areas of high concentrations of ethnic minorities (downtown stations are not included). It includes a comparison before and after the initiation of night service. During this period, the overall daily patronage of BART increased by approximately seven percent (7.4%), from 122,700 in 1975 to 131,800 in 1976. The addition of evening service has added 4,700 passengers to BART's daily patronage over this period.

Table III-9 appears to corroborate the findings of BART Police and the Environment Project that crime in ethnic minority station areas has not increased since the addition of evening service. Of the offenses considered,²⁸ reported security incidents actually decreased 2.1 percent from 1975 to 1976 in station areas with high concentrations of ethnic minorities. During the same period, reported incidents in areas with low concentrations of ethnic minorities increased by fifty-nine percent (59%). Most of the crime in both high and low concentrations of ethnic minority communities is centered around auto burglary and petty theft. Vandalism, drunkenness, and auto theft are of lesser incidence. For communities with high concentrations of ethnic minorities, the greatest increases in reported incidents were for drunkenness and drug use during this period. Auto related burglary and vandalism reports

²⁵ Gruen Associates, Inc. and DeLeuw, Cather and Company: Responses of Nearby Residents to BART's Environmental Impacts (TM), January 1977.

²⁶ Gruen Associates, Inc. and DeLeuw, Cather & Company: Environmental Impacts of BART: Interim Service Findings (Final Report), January 1976.

²⁷ Interview with Emory Curtis, Curtis Associates, subcontractor to Gruen Associates, Inc., Environment Project.

²⁸ Fare evasion and other incidents not related to personal security were omitted from the comparison.

Table III - 9

REPORTED SECURITY INCIDENTS IN AREAS OF
HIGH CONCENTRATIONS OF ETHNIC MINORITIES:
BEFORE AND AFTER EVENING SERVICE

Offense	1975 Before Evening Service				1976 After Evening Service			
	Sept.	Oct.	Nov.	Total	Sept.	Oct.	Nov.	Total
Aggravated Assault					1			1
Arson	1			1			3	3
Auto Theft	10	12	9	31	8	8	17	33
Battery	1	2	2	5	3	2		5
Burglary:								
Structure	2	2		4	2		3	5
Auto	36	26	21	83	15	14	23	52
Disorderly Conduct	2	1	3	6	2	3	4	9
Drunkenness	4	5	3	12	15	7	10	32
Grand Theft								
Pocket Picking					1			1
Purse Snatching								
Other		1		1	1	1		2
M/ M								
Narcotic drug laws	1	1		2	3	3	9	14
Petty theft	27	20	22	69	20	28	22	70
Robbery	1	2	2	5	5			5
Rock Throwing	3	2	2	7	1	1		2
Sex Offenses		1	1	2	1	1		2
Vandalism	22	15	13	50	9	13	14	36
Weapons		1	1	2	2			2
				280				274 (-2.1%)

Source: BART Police Services Department, "Report of Offenses and Miscellaneous Reports", 1975 and 1976.

decreased during this period. These compare with larger reported incident increases for burglary, drunkenness, disorderly conduct, drug use, petty theft, rock throwing and vandalism in stations within areas of low concentrations of ethnic minorities.

Police Surveillance and Protection

Police responsibility for security within BART stations, on the trains and in BART parking facilities is assumed by the BART Police Services Department. This security force is made up of approximately ninety (90) "sworn" personnel,²⁹ both uniform and plainclothes. A relatively sophisticated command control system coordinates and directs the BART Police surveillance activities. Interviews with BART riders indicate only a very small number feel unsafe in terms of their personal security when using BART.³⁰ Outside the station, police protection and enforcement is the responsibility of the many local jurisdictions in which BART operates. Interviews with local police personnel have lead to the conclusion that no major changes in law enforcement procedures or assignments have occurred in areas in which stations have been introduced.³¹ There is no evidence to suggest that there exist differences in the level of BART or local police surveillance and protection between areas of low and high concentrations of ethnic minorities.³²

Perceptions of Personal Security

Are there differences from the general population in the ways in which ethnic minorities, the elderly and the handicapped perceive the impact of BART on their personal security? At all seven line sites included in the survey of residents near BART, the perceived effect of BART on crime in the area was minimal, or as in one case, slightly beneficial.³³ Similarly, for the station sites studied, the few adverse reactions reported were

²⁹ "Sworn" personnel are police staff authorized to make arrests.

³⁰ Curtis Associates and DeLeuw, Cather & Company: Environmental Impacts of BART: Community Monitoring - Phase II (WN), February, 1977.

³¹ Interview with Emory Curtis, Curtis Associates. Subcontractor to Gruen Associates, Inc. Environment Project.

³² Ibid.

³³ Gruen Associates, Inc and DeLeuw, Cather & Company: Response of Nearby Residents to BART's Environmental Impacts (TM), January, 1977.

outweighed by higher levels of reported beneficial impact. However, a substantial portion of the residents surveyed at the Concord site (majority area) noted bad effects of BART on crime. The response may be an expression of general dissatisfaction with BART, primarily due to frustration with the overflow parking condition which exists at the Concord station. Local police do not report a significant increase in crime in the area. It is the general conclusion that the study results offer no indication that ethnicity, education or income have any significant effects on the perception and evaluation of BART's environmental impacts.³⁴ This conclusion appears to hold for the specific case of perception of BART's impact on crime and personal security.

Conclusion

The overall impact of BART on crime and personal security is minimal in both areas of high and low concentrations of ethnic minorities. Initiation of evening service does not appear to have contributed to an increase in personal security problems within the BART system. There is no indication of differences in police surveillance and protection between areas of low and high ethnic concentrations. Similarly, no evidence has been revealed which supports the hypothesis that there are differences in the way minorities, the elderly and the handicapped perceive personal safety.

³⁴ Gruen Associates, Inc. and DeLeuw, Cather & Company: Response of Nearby Residents to BART's Environmental Impacts (TM), January, 1977.

BART construction activities caused greater disruption in ethnic minority communities over a more prolonged time period than in non-minority communities. Upon completion of BART, adverse long-term environmental effects were less in minority than non-minority communities.

Duration of Construction Impacts

In order to analyze variations in the duration of the BART construction period for different areas, a summary of BART construction contracts was reviewed for projects within areas of high and low ethnic concentrations and downtown areas.³⁵ This information provides an overview of relative differences in duration of construction impacts for various configurations of BART facilities within different areas. However, a more detailed, site by site, analysis would reveal that actual construction impacts did not necessarily occur throughout the contract period. For example, the Environment Project has concluded that the most disruptive period of station construction averaged only about six months.³⁶

Tables III-10 and III-11 indicate the type, length and location of BART construction contracts within communities containing high and low concentrations of ethnic minority residents, respectively. The earliest BART construction work began at the Ashby station (1966) and the last station to be completed was Concord (1973).

Longer construction period requirements for subway sections and transfer station construction located in the higher density urban areas resulted in substantially longer periods of construction impact in areas of high concentration of ethnic minorities than in areas of low ethnic minority concentration. In order to minimize long term environmental impacts, resulting

³⁵ Bay Area Rapid Transit District. Summary of Construction Contracts.

³⁶ Gruen Associates, Inc. and DeLeuw, Cather and Company: Environmental Impacts of BART (Final Report), July, 1977.

Table III - 10

BART CONSTRUCTION CONTRACTS SUMMARY;
AREAS OF HIGH CONCENTRATIONS OF ETHNIC MINORITY RESIDENTS

Station	Station Area Construction		Type of Station	Type of Construction Line Segment ^c	Adjacent Transportation Facilities ^c
	Start ^a	Finish ^a Duration ^b (in mos.)			
Richmond	03-70	01-72 22	surface	surface, aerial	Railroad alongside.
North Berkeley	11-66	06-71 55	subway	aerial, surface, subway	Separate right-of-way, arterial alongside.
Ashby	11-66	10-72 71	subway	aerial, subway	Arterial median.
Union City	04-70	06-72 26	surface	aerial, surface	Railroad alongside.
Coliseum	06-68	01-71 33	aerial	aerial	Railroad alongside, arterial alongside.
Fruitvale	07-68	05-70 22	aerial	aerial	Railroad alongside, arterial alongside, arterial median.
Lake Merritt	07-67	10-71 51	subway	surface, subway	Railroad alongside, freeway alongside
MacArthur	07-66	05-70 46	surface	surface, aerial, subway	Freeway median.
West Oakland	06-70	10-71 16	aerial	aerial	Arterial median, separate right-of-way, freeway alongside.

(continued on next page)

Average duration of construction 39.5 months (3.29 years).

^aSource: BART. "Summary of Construction Contracts."^bWithin 1 or 2 months.^cSource: Gruen Associates. "Work Sheets." Environment Project, BART Impact Program.

Table III - 10 (continued)

BART CONSTRUCTION CONTRACTS SUMMARY:
AREAS OF HIGH CONCENTRATIONS OF ETHNIC MINORITY RESIDENTS

Station	Station Area Construction		Type of Station	Type of Construction Line Segment ^c	Adjacent Transportation Facilities ^c
	Start ^a	Finish ^a Duration ^b (in mos.)			
Daly City	03-71	05-73 27	aerial	aerial, surface	Freeway alongside.
Balboa Park	07-68	01-72 42	subway	aerial, surface, subway	Freeway alongside.
Glen Park	07-68	03-72 44	subway	subway	Freeway alongside, separate right-of-way.
Mission-24th	04-67	01-72 57	subway	subway	Arterial median.
Mission-16th	04-67	01-72 57	subway	subway	Arterial median.
Hayward	06-68	06-70 24	aerial	surface, aerial	Railroad alongside, arterial alongside.
		593			

Average duration of construction 39.5 months (3.29 years).

^a Source: BART. "Summary of Construction Contracts."

^b Within 1 or 2 months.

^c Source: Gruen Associates. "Work Sheets." Environment Project. BART Impact Program.

Table III - II

BART CONSTRUCTION CONTRACTS SUMMARY:
AREAS OF LOW CONCENTRATIONS OF ETHNIC MINORITY RESIDENTS

Station	Station Area Construction		Type of Station	Type of Construction Line Segment ^c	Adjacent Transportation Facilities ^c
	Start ^a	Finish ^a Duration ^b (in mos.)			
Concord Pleasant Hill	03-71	02-73	surface	surface	Railroad alongside.
	01-69	05-71	aerial	surface, aerial	Railroad alongside, freeway alongside.
Walnut Creek Lafayette Orinda	04-70	10-71	aerial	surface, aerial	Separate right-of-way.
	08-70	08-72	surface	surface	Freeway median.
	06-70	04-72	surface	surface, subway	Freeway median, separate right-of-way.
Rockridge	04-70	05-72	aerial	aerial, surface, subway	Separate right-of-way, freeway median.
	02-70	12-71	aerial	aerial, surface	Railroad alongside.
Del Norte El Cerrito Plaza Fremont	02-70	12-71	aerial	aerial	Railroad alongside.
	02-70	12-71	aerial	surface	Separate right-of-way, railroad alongside.
	06-70	12-71	surface	surface	Railroad alongside.
South Hayward Bayfair San Leandro	04-68	06-70	surface	surface	Railroad alongside.
	04-68	11-69	aerial	surface, aerial	Railroad alongside.
	04-68	06-70	aerial	aerial	Railroad alongside, arterial alongside.
		268			

Average duration of construction 22.3 months (1.86 years).

^a Source: BART. "Summary of Construction Contracts."

^b Within 1 or 2 months.

^c Source: Gruen Associates. "Work Sheets." Environment Project. BART Impact Program.

from BART's continued operations (noise, vibration, barrier, etc.), BART planners chose subway construction in the more dense central areas of the Bay Area in which ethnic minorities tend to reside in high concentrations. Half of the stations in ethnic minority areas experienced subway construction while none of the stations in non-downtown areas with low concentrations of ethnic minorities were subject to subway construction. In these areas, aerial or surface configurations were typically used. This could be completed over a shorter time span, and generally with much less disruption to adjacent communities.

The duration of construction can be estimated from the analysis of contract period start and finish dates. For the fifteen (15) non-downtown stations with high concentrations of ethnic minorities, construction contracts averaged 39.5 months per station area compared with an average of 22.3 months per station for the twelve (12) stations with low concentrations of ethnic minorities. Comparison of length of construction periods can be viewed in another manner. Of the fifteen (15) minority station areas, twelve (12) were still experiencing construction activities after 22.3 months mean average construction period for station areas with low concentrations of ethnic minorities. After forty (40) months of construction, eight (8) of the fifteen (15) ethnic minority station areas were still experiencing construction (Table III-12). According to BART construction records, station construction within communities with few ethnic minorities did not last in any case for more than twenty-six (26) months.

BART construction activity in downtown areas was much longer than in other areas. Table III-13 indicates that each station on the average required five and a third years to complete. Including beautification, street improvements, BART and Muni improvements along Market Street in San Francisco, construction activity along the street has continued for more than a decade and is still taking place. In addition to the large regional population working or visiting downtown areas daily, a large number of ethnic minority persons and/or the elderly live in the downtown area. At least one of these special groups resides in high concentration in the immediate area of each of the downtown stations, except Berkeley.

Extent of Construction Impacts

Cut-and-cover subway construction had a substantial impact on access and traffic safety in areas where it was required. In suburban stations and aerial line segments, the majority of persons who lived within one block of BART remember BART's construction as having "bad" or "very bad" effects; dust and dirt, noise, truck traffic, torn-up streets, and removal of homes were

Table III - 12
CONSTRUCTION DURATION SUMMARY:
NON-DOWNTOWN AREAS

Months	High Concentrations of Ethnic Minority Residents	Low Concentrations of Ethnic Minority Residents
more than 22.3 ^a	11	5
more than 30.0	9	0
more than 40.0	8	0
more than 50.0	5	0
more than 60.0	1	0
more than 70.0	1	0

^a Mean average construction contract period for stations areas with low percentages of ethnic minorities.

Source: BART. "Summary of Construction Contracts."

Table III - 13
CONSTRUCTION DURATION SUMMARY:
DOWNTOWN AREAS*
(San Francisco, Oakland, Berkeley)

Station	Start ^a	Finish ^a	Duration ^b	Minorities ^c	Elderly ^d
Montgomery Street	7-67	12-72	65	Yes	No
Powell Street	8-67	8-73	72	No	Yes
Civic Center	5-67	2-75	93	No	Yes
Embarcadero	5-73	4-76	35	Yes	No
19th Street	1-67	2-72	61	No	Yes
12th Street	2-67	2-72	60	Yes	Yes
Berkeley	10-66	12-71	62	No	No
			448		

Average Duration of Construction = 64.0 months (5.33 years).

^a Source: BART. "Summary of Construction Contracts." Does not include beautification or street improvement projects.

^b Within 1 or 2 months.

^c More than 40 percent ethnic minority population in adjacent area (1/2 mile).

^d More than 15 percent elderly population in adjacent area (1/4 mile).

* Does not include subway sections between stations, but does include mezzanine extensions and station entrances.

cited most often.³⁷ However, analysis of the perceptions of residents within the entire four-block deep sites, shows that a small majority rated the overall effects of the BART construction as insignificant, balanced, or good in most of the ten sites surveyed.

BART construction within or adjacent to heavily used transportation facilities may have compounded impacts, by greater disruption of traffic and pedestrian circulation, affecting more persons and businesses on adjacent segments of higher land use development and density. In areas with high concentrations of ethnic minorities, BART construction occurred within heavily utilized arterials, freeways, and to a lesser extent, along railway and freeway rights-of-way. These locations constituted about sixty-five percent (65%) of the total construction in ethnic minority communities. In areas with few minorities, however, no BART construction occurred within arterial medians and relatively little occurred either alongside freeways or within freeway medians. Nearly half of BART construction in areas with few minority residents occurred alongside railroads or in separate rights-of-way. These two configurations comprised about sixty-five percent (65%) of construction activities in areas with low minority concentrations.

In general, housing and business displacement appears to have been substantially less in areas of high ethnic concentrations as a result of 1) BART's design configuration requiring more new rights-of-way acquisition, and 2) greater provision of parking facilities in areas with low concentrations of minorities. Based on the best, although incomplete, source of housing displacement data available, 464 (1.3% of total) residential units were acquired within census tracts of high concentration of Blacks and persons of Spanish heritage (+40%) compared to 2,397 (2.8% of total) in majority areas.³⁸ Approximately eighty-seven percent (87%) of the residential units taken in census tracts with high ethnic minority population concentrations were in Oakland and Berkeley.

³⁷ Gruen Associates, Inc. and DeLeuw, Cather & Company. Response of Nearby Residents to BART's Environmental Impacts (TM), January, 1977.

³⁸ John Blayney Associates. "Work Element II Data Files." Land Use and Urban Development Project. September, 1977.

Relocation assistance was minimal for those whose households were acquired. Less than sixteen percent (15.8%) of the owners (renters not eligible) received financial relocation assistance.³⁹ Displacement was especially severe on the elderly, most of whom had lived in their residences for many years.⁴⁰

Conclusion

Residential areas with high concentrations of ethnic minorities were subject to longer periods of construction affecting more people in locales which were more sensitive to disruptive effects (e.g., within street sections or community commercial areas). Construction activity in downtown areas was even longer and more severe than in urban residential or suburban areas. In downtown San Francisco and Oakland, the elderly and ethnic minority residents were adversely effected by construction activities. The extensive use of subway sections and related downtown street improvement and beautification programs are the primary factors for extending construction activities in these areas. On the other hand, greater housing displacement was required in areas of low concentrations of ethnic minorities.

³⁹ John Blayney Associates. "Work Element 11 Data Files." Land Use and Urban Development Project. September, 1977.

⁴⁰ Gruen Associates, Inc. and DeLeuw, Cather and Company. Environmental Impacts of BART (Final Report), July, 1977.

BART has improved the environmental quality of communities around stations because of related street improvement projects, beautification programs, parks and landscaping, including passive and active recreational facilities.

Improvement Projects

A number of street improvement, beautification, parks and landscaping projects were developed as part of, or in conjunction with, the construction of BART. In some cases, funding for these projects came in whole, or in part, from BART. In many cases, funding was provided by other jurisdictional funding sources coordinating improvements programming with BART's construction.

Improvement projects were developed in all major areas served by BART; downtown areas, urban residential and suburban. They represent impressive aesthetic contributions which benefit Bay Area visitors, majority and ethnic community residents, the elderly and the handicapped. The extent of this program is illustrated by a listing of a few of the major projects:

Downtown

- Market Street-San Francisco - a massive \$24.5 million project which extends 2.2 miles from the Ferry Building to the Central Freeway Overpass. The project includes widened sidewalks and ramps for handicapped persons. Other features are doubled rows of trees, innovative street-light systems, plazas, and street furniture. City of San Francisco, general obligation bond provided funding; however, total costs of the project were probably less because of BART constructions.⁴¹

⁴¹ Booz, Allen & Hamilton. The Impact of BART on Local Government Expenditures, Revenues and Financial Policies. (WP). July, 1977.
Funding data available only for case study sites.

Areas of High Ethnic Minority Concentration (Selected Projects)

- Shattuck Avenue, Berkeley - this 12 block street improvement program includes a block-long plaza, widened sidewalks, landscaped pedestrian areas and a re-engineered street. The cost of the project is estimated to be \$100,000 per block.
- Nevin Mall, Richmond - this project was created by closing six blocks in a designated downtown redevelopment area. The mall intersects with the BART mezzanine below grade. Cost of the project is approximately \$300,000.
- Mission Street, San Francisco - BART subway stations at 16th and 24th Streets open into plazas. The plazas connect with widened sidewalks where trees and street furniture were added. The project is estimated to cost \$1,000,000. City of San Francisco, general obligation bond provided funding.

Areas of Low Ethnic Minority Concentration (Selected Projects)

- Linear Park, El Cerrito - a 2.9 mile, landscaped section under BART aerial trackway contains a bikeway, walkway, picnic, lawn areas, landscaping, and trees. The project is highly valued by nearby residents.⁴²
- Tree Planting and Landscaping - smaller projects have also occurred in the Concord and Lake Merritt stations.

As a part of the ITD Project, these improvements have been field surveyed. Improvements generally reflect the character of the surrounding environment. Improvements within communities with high concentrations of ethnic minorities appear to serve a large number of people throughout a community or regional area. The impacted population group is fairly large in these areas because of typically higher population densities in the area and since their more central location implies greater exposure for persons traveling in the Bay Area region. Because of the urban character of the surrounding areas, beautification and recreational projects in areas with

⁴² Gruen Associates, Inc. and DeLeuw, Cather and Company: Response of Nearby Residents to BART's Environmental Impacts (TM), January, 1977.

high concentrations of ethnic minorities, typically are designed for more passive recreational use (visual aesthetics, walking, sitting, etc.) and extensively utilize architectural, rather than naturalistic elements.

Because of lower population densities and less central location, improvement programs in suburban areas with few ethnic minority residents, tend to serve fewer people, but provide direct benefit to adjacent neighborhoods and communities. It has been observed that recreational facilities in these areas are more likely to include active recreational facilities (bikeway, playgrounds, etc.) e.g. El Cerrito linear park.

Of the above projects, only Mission Street appears to be poorly maintained. Although initially attractive, brick street paving is broken (asphalt is being used to repair these areas), street trees have been cut down or removed, litter accumulates in doorways, adjacent to curbs and across sidewalks. These attributes, coupled with the high rate of store vacancies (particularly around the 16th Street station) provide strong indications of a once strong community shopping street which is in a state of physical and economic decline. How much of the decline is attributable to BART subway construction which lasted for 57 months, and/or other factors will be examined within the Land Use and Urban Development Issues section of the ITD Project.

Conclusions

Bay Area residents have received considerable benefit from the street, landscaping and beautification projects coordinated with BART's construction. Pedestrian traffic in many BART station areas has been substantially enhanced. All population sectors in the Bay Area gained from these environment projects and programs. The elderly and the handicapped received circulation benefits from the pedestrian orientation (curb cuts, signing, street furniture, etc.) of many of the projects, e.g. Market Street improvement project. Improvements generally reflect the character of the surrounding area. Mission Street is the only project which is poorly maintained.

IV. IMPLICATIONS

The overall purpose of the ITD Project is to identify the implications for the transportation disadvantaged of the BART system, and to draw these in such a manner as to permit their transferability to other major urban areas considering development of rapid rail mass transportation systems, such as BART. The investigation of six BART-related environmental impact issues in this report has resulted in the following initial listing of BART's implications for the transportation disadvantaged. A complete and finalized identification of implications will be included in the Final Report of the ITD Project. It will include not only environmental, but mobility, economic and land use and urban development impact issues, as well.

Residential Patterns

While there exists considerable variation within the Bay Area metropolitan region, the analysis of population profile and residential locational data supports the general conclusion that ethnic minorities are more likely to reside in urban-residential areas with relatively high population density, mixed land uses and incomes typically lower than those of the regional average. Due to these factors, a given environmental impact stimulus (e.g. overflow station parking of 500 vehicles) occurring in the typical high ethnic minority population area is likely to affect more people, many of whom are low or moderate income, than the same impact would affect in lower density suburban areas with lower concentrations of ethnic minorities.

Location and Configuration of Mass Transit Rapid Rail System

The principal travel service objective of the BART system is to serve long distance, work-related, peak hour travel to and from the downtown areas of the Bay Area - San Francisco, Oakland and Berkeley. The placement of BART lines and stations necessarily has reflected this primary objective; suburban and peripheral urban residential communities have been connected with downtown financial and commercial centers, trans-ecting central areas in which ethnic minorities tend to live in higher concentrations.

The configuration selected by BART planners was typically subway sections in these higher density urban core areas - intensifying construction impacts and minimizing long-term operational negative environmental impacts. It is also clear that major transfer stations are more likely to be constructed in these more centrally located urban areas (or downtown) than in suburban areas. Thus, a major implication of the BART system

is that, although primarily designed to serve suburban-CBD commuter travel, a substantial level of environmental impact occurs within areas of high ethnic concentration.

Construction Impacts

As could be expected with a major civil engineering project undertaken in a built-up urbanized region, the \$1.6 billion BART project created substantial environmental impacts during its construction. However, construction impacts of this rapid rail system were moderate, in comparison to those experienced with urban freeway construction; particularly in terms of lower household and business displacement.

Construction impacts will vary considerably with type of design configuration selected for a given line segment or station area - subway, at-grade or aerial. Since subway sections are likely to be chosen for high density central areas, construction impacts tend to be longer and more severe in these areas where ethnic minorities will to live in higher concentrations. These areas are typically older transitional areas where businesses and employers may be less likely to survive extended periods of disruption.⁴³

Operational Impacts

Environmental impacts resulting from BART's operations are generally of a low order of magnitude, both in terms of actual incidence and perception by the residents of the area in which BART operates. Due to a number of factors, including greater provision of auto access, off-street parking facilities and greater use of surface and aerial design configurations, BART's negative operational impacts occur with somewhat greater intensity in suburban areas with low concentrations of ethnic minority residents. However, there are important exceptions to this general conclusion; these are areas of high ethnic concentrations experiencing substantial environmental impacts affecting a large number of persons due to higher population densities.

The two principal negative environmental impacts are 1) auto access-related impacts, particularly overflow parking around BART stations, and 2) noise levels along aerial line segments.

⁴³ This issue will be examined in subsequent work elements of the ITD Project (Work Element 3.3).

BART-Related Parking

Overflow parking from BART lots is a problem around more stations located in areas of low ethnic minority concentration than in areas of high ethnic minority concentration. BART has provided off-street parking at stations in these suburban stations to a greater extent than in the more centralized, urban residential areas. An important exception to this generality, is the Daly City station area (high ethnic minority) which will soon have the largest of all BART parking facilities. The Daly City station is somewhat of an anomaly, being an end-of-the-line collector station in an urban residential area located both within Daly City and San Francisco. Thus, its auto-access related problems may be seen in part as a result of the decision not to extend the BART system into San Mateo County to serve the peninsula commuter-shed area.

Another implication deriving from BART-related parking problems, is that BART and community planners face an increasingly difficult problem in two San Francisco urban residential station areas, both with relatively high levels of ethnic minority concentrations - Balboa Park and Glen Park. BART-related parking will continue to be a growing problem in these areas where commuters are using their autos for access to and from these stations, but no BART off-street parking has been provided. Can these BART users be persuaded to change their access mode through improved bus feeder service or, on the other hand, restrictive parking programs? Should parking facilities be constructed, causing additional environmental disruptions to these areas and their residents?

Noise

The second most significant negative environmental impact of BART's operations is noise levels perceptively higher than background levels in some areas, particularly along aerial line segments. Because ambient noise levels are characteristically high in the urban residential areas in which the highest concentrations of ethnic minorities are found, BART related noise pollution is relatively minimal in such areas, even where subway segments were not chosen.

Other negative environmental impacts associated with the BART rapid rail system (loss of privacy, visual obstruction, barriers, increased crime, etc.) were found to be generally negligible with no disproportionate impact on the transportation disadvantaged.

Similarly, BART's principal positive environmental impact, coordination of

Several implications regarding the economic burden of rapid rail systems such as BART may be drawn from the experience in the Bay Area. The introduction of BART in the regional transit system occurred in an area where both the level and costs of public transportation were higher than in most parts of the country. The financing plan that has evolved to pay for this relatively expensive component of the regional transit system has not, as of yet, developed an alternative to its reliance on local regressive revenue sources. As a result, households and especially lower-income families and individuals bear the heaviest burden of the costs of BART's operation. When a larger share of the costs of funding the operating deficits of rapid rail systems is supported by federal and state assistance deriving from progressive personal and corporate income taxes, and/or when less regressive means of local revenue funding sources are pursued, a more equitable financing plan may be possible in terms of the established notion of ability-to-pay equity.

To the extent that the income distribution, residential location, and employment patterns of the ethnic minority populations of other regions are similar to those of the Bay Area, a disproportionately small travel service benefit for these groups should be anticipated as part of the implementation of a regional, commuter-oriented rapid transit system. Economic and land use benefits of the transportation disadvantaged may be expected to be correspondingly low. Therefore, equity considerations require that a major policy objective in the development and financing of such systems should be to pursue financing methods which provide for a closer correspondence of burden and benefit among the population groups affected, and to minimize regressivity in the methods of raising revenues to pay for them.

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NOTE: References are made to four types of documents produced by the BART Impact Program. The type of document is indicated by code initials in the document number. They are:

FR - Final Reports: summary documents describing and interpreting the findings of all technical work accomplished within a Project.

TM - Technical Memoranda: reports which describe the analysis and impact findings in specific areas of inquiry.

WP - Working Papers: reports of primarily methodological interest.

WN - Working Notes: unpublished Project documents primarily for the purpose of outlining methodology or documenting data.

